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FLORA OF THE CARQUINEZ STRAIT REGION, CONTRA COSTA AND SOLANO COUNTIES, CALIFORNIA

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ABSTRACT

The Carquinez Strait region is an area in the northeastern San Francisco Bay Area of California characterized by typical coastal lowland California vegetation dominated by oak woodland, grassland, and coastal scrub. From 1996 through 2010, an inventory of vascular plants was amassed. Of the 795 taxa found within the study area, 13 are ferns, 4 are gymnosperms, and 778 are angiosperms. Of eudicots and monocots, 41% (249) and 46% (79) respectively, are adventives introduced since European colonization. Despite the accessibility of the region and the proximity of institutional herbaria, relatively few collections were made in the study area before the beginning of this study.

Key Words: California, carquinez, contra costa, flora, solano.

INTRODUCTION

Description of Area

Circumscription. The Carquinez Strait runs east to west from the Suisun Marsh to San Pablo Bay, California. The Suisun Marsh is the area of confluence of the two largest river systems of California, the Sacramento River System, which drains the northern interior of the state, and the San Joaquin River System, which drains the southern interior of the state. San Pablo Bay comprises the northern portion of San Francisco Bay. The study area comprises lands adjacent to the Carquinez Strait, forming an area whose borders are the shore of San Pablo Bay to the west, Pacheco Slough to the east, the Lake Herman Valley and Austin Creek to the north, and Pinole and Alhambra Creeks to the south (Fig. 1). The lands to the north and south of the strait are in Solano and Contra Costa counties, respectively. This area is approximately 22 km from east to west and 16 km from north to south.

Notable features. The study area (Fig. 1) is dominated by dissected ridges running in a roughly west-northwest direction. To the north of the strait is Vallejo Ridge, with peaks around 170 m. To the south of the strait are Carquinez (the smallest), Franklin, and Pinole Ridges, with the tallest peaks of the latter two reaching about 300 m.

The dominant waterway is the Carquinez Strait itself; it is ca. 1.5 km wide at the Benicia Bridge in the east and ca. 0.95 km wide near the Carquinez Bridge to the west. The strait is subject to tidal action. Originally the strait was an area of mixing

of fresh and saltwater; water diversion upstream has led to increased salinity in much of the strait (Conomos 1979). The mouth of the Napa River (Mare Island Strait), northwest of the Carquinez Strait, is also tidal, as is Pacheco Slough on the southeastern border of the study area. Streams that flow west into the bay, e.g., Pinole and Franklin creeks, serve as conduits for coastal fog and have a slightly different biota than streams that flow north or south into the strait, e.g., Alhambra Creek. Smaller streams drain from the ridges; some, such as Alhambra Creek, Big Bull Valley Creek, and Edwards Creek are perennial streams; most are intermittent in nature and dry during the summer and fall.

Climate. The study area, as with the surrounding regions, has a Mediterranean-style climate with warm, dry summers and cool, wet winters. July, August, and September have little measurable rainfall. Mean annual precipitation varies from 46 cm of rain each year in the eastern sector (Martinez) to 56 cm of rain each year 2 km southwest of the area at Point Richmond (National Weather Service 2010). The western portion of the study area receives extra moisture in the form of summer fog that enters San Pablo Bay via the Golden Gate. Annual mean minimum temperature in January is 4°C in the east and 5.5°C in the west. Frosts, although not common, occur one to seven nights in a typical winter, being more common in the east. Annual mean maximum temperature in July is 31.5°C in the east and 22°C in the west.

Geology/soils. The origin of the Carquinez Strait appears linked to the uplift of the east



FIG. 1. An aerial photograph showing major collecting localities and the borders of the Carquinez Strait Region as defined in this study. The inset shows the location of the region within California. Numbers on the photograph indicate localities in Appendix 1.

San Francisco Bay region (Graymer et al. 1994, 2002). By the late Miocene (ca. 9.5 Ma) the region was uplifted and formed the western shore of an embayment (Graham et al. 1984). The Carquinez Strait opened about 0.6 Ma and drained a large, short-lived, freshwater lake (perhaps lasting 50,000–100,000 years), which occupied the present-day San Joaquin Valley (Sarna-Wojcicki et al. 1985).

The bedrock of the Carquinez Strait area is almost exclusively sedimentary. Most of it was formed from erosion products deposited in marine settings: sandstones of varying compositions, conglomerates, shales, siltstones, mudstones, and claystones deposited from the late Cretaceous (99 to 65 Ma) to the middle Tertiary (Miocene, ca. 10 Ma). Later sedimentary rocks (end of the Miocene to the beginning of the Pliocene) were generally deposited in terrestrial settings as the local region was uplifted and the terrane comprising the nascent Coast Ranges closed off from the Pacific Ocean what would become the Great Valley. The units and formations generally trend along a northwest-southeast axis paralleling the major faults in the area. Vegetation differences are noted where bedrock is exposed, such as Pinole Peak where imbricate phacelia (*Phacelia imbricata* subsp. *imbricata*),

redberry (*Rhamnus crocea*), and winecup fairyfan (*Clarkia purpurea* subsp. *purpurea*) uniquely occur in the study area. On outcrops of Neroly sandstone, such as Ozol Rock, one finds the locally uncommon plant community chaparral supporting plants such as chamise (*Adenostoma fasciculatum*), chaparral paintbrush (*Castilleja foliolosa*), and Mount Diablo fairy lantern (*Calochortus pulchellus*).

Small exposures of tuff (derived from volcanic ash-fall) occur near Rodeo and Pinole, where locally uncommon plants such as perennial salsola (*Salsola australis*), California shadscale (*Atriplex californica*), and sticky sandspurrey (*Spergularia macrotheca* var. *macrotheca*) occur on the bluffs. Clay lenses occur in small patches along the north-facing slopes bordering the strait. These soils support clay endemics, such as Jepson's eryngo (*Eryngium jepsonii*) and clay mariposa-lily (*Calochortus argillosus*).

History of Land Use

Indian. The Karkin tribe (whence the name Carquinez) was a northern element of the Ohlone (Costanoan) language group that occupied both sides of the Carquinez Strait (Heizer 1978). Because the tribe was relatively small (hundreds)

and their culture was disrupted early in European colonization, little is known about the tribe. Their language was a distinct member of the Utian language family; only a vocabulary compiled in the late 18th century survives (Beeler 1961). The Karkin were bordered on the east by Yokuts and to the north by Patwin. There was a settlement on the shore of what is now Vallejo, where members of various tribes gathered to trade, as is documented by archeological remains (Davis 1974). We assume that, like other Ohlone tribelets, the Karkin's staples comprised seeds, bulbs, and fruits, especially acorns, supplemented with game and seafood (Margolin 1978). Some of the plants consumed by the Ohlone include seeds of dock, tarweed, buckeye, and California bay laurel. Acorns are a notoriously variable food source; early Californians managed their environment by pruning, burning, and reseeding to maximize plant and animal production (Margolin 1978). These vegetation manipulations most likely had a significant, but unknown, effect on the flora.

European. The advent of European and Latin American immigrants has had a profound effect on the flora of the region. Most of the land included in the study area is hilly and unsuitable for intensive agriculture. Most flat areas are located along the shores near alluvial deposits. These areas were ideal for settlements, as they were easy to build on, near the major water-transporation routes, and had access to fresh water from perennial streams. By the end of the 19th century, Vallejo, Martinez, Benicia, and other settlements were well established. Although these urban areas covered a relatively small percentage of the land within the study area, they had a disproportionate impact on wetlands of various types that occurred predominantly in the low, flat areas chosen for habitation. In the early 20th century, large areas of salt marsh were filled and developed to provide space for industries such as oil refining, smelting, brick manufacture, and sugar production, as well as direct access to shipping. In addition, demand for wood for domestic use near houses and for the trains that soon plied the railway built along the southern shore of the strait led to removal of trees from many of the drainages adjacent to these areas of activity. In some denuded areas between the towns of Crockett and Port Costa, groves of blue gum (*Eucalyptus globulus*) were planted to provide lumber and, as "plantation lands," tax breaks. Although these introduced trees have not spread significantly beyond their original groves, they have largely prevented the reestablishment of native vegetation in these areas.

Agriculture/cattle. Perhaps the most profound biotic changes to the study area resulted from the wide-scale development of ranching combined

with the introduction of Old World plants adapted to human-associated disturbance. Although there were native large herbivores, particularly black-tailed deer (*Odocoileus hemionus* subsp. *columbianus*) and tule elk (*Cervus canadensis*) (Jameson and Peeters 2004) in the study area before the advent of Europeans, the practice of repeated, concentrated cattle grazing created conditions under which introduced weeds could flourish and spread. Region-wide, the effect of this was to increase the beta (overall) diversity of the flora (note the large proportion of the reported flora that is not native to California). The alpha (site-specific) diversity of some sites subject to intensive grazing was reduced as cattle-tolerant taxa replaced native taxa in some areas. In particular, the replacement of native perennial grasses and forbs by non-native annual grasses and forbs is notable in the study region, as it is throughout much of California (Crampton 1974; Heady 1977).

Development. After the initial development in the 19th century, urban growth in northern Contra Costa and southern Solano counties was modest. As the road system developed in California, the main commercial arteries shifted away from the waterways and the study area became a relative backwater. This began to change in the last decades of the 20th century, as rising population and real estate prices drove people to search for housing farther from San Francisco. This second wave of residential growth was more intense in certain portions of the study area (e.g., Vallejo and Martinez) than in others (e.g., the central northern portion of Contra Costa County) due to local zoning restrictions, resident resistance to suburban sprawl, and acquisition of land as permanent open space (Entrix, Inc. unpublished data).

Open space. The establishment of the East Bay Regional Parks District in 1934 has had profound effects on the preservation of the local flora in the area south of the Carquinez Strait. Tracts of land within the study area are preserved within the Carquinez Strait Regional Shoreline, Martinez Shoreline, and Point Pinole parks. Larger areas adjacent to these parks and along Franklin Ridge are partially preserved through zoning that allows only sparse development (Contra Costa County 2005). In addition, the Muir Heritage Land Trust preserves significant portions of Franklin Ridge as open space. The John Muir National Historic Site, managed by the National Park Service, preserves land in Martinez once owned by Muir family, including Mount Wanda, the Muir House property, and the Muir-Strenzel gravesite along Alhambra Creek. In the northern portion of the study area, there are fewer naturally vegetated parks. Significant natural areas are preserved in Benicia State Recreation

Area and Mare Island, and in northern Benicia (south and west of Lake Herman).

Wildlife conservation. A major goal of wildlife management in California has been to increase the number of black-tailed deer (Smith 2000). The increase in the population of the black-tailed deer in the study area during the latter half of the 20th century has had an unknown, but probably significant, impact on the vegetation. In certain areas, a distinct browse zone may be identified, creating a clear area underneath oaks. Deer browsing has not seemed to prevent the establishment of coastal scrub on road verges and other previously grassy areas excluded from cattle grazing.

A significant predator of deer is the puma (*Felis concolor*). Protection of puma by the California Department of Fish and Game has led to an increase in the numbers of this large cat. Pumas have been sighted within the southern portion of the study area. The direct effect of these deer predators on the flora would be negligible, but as population numbers increase they may have an indirect effect on the flora via deer behavior and population size as documented in Utah (Ripple and Beschta 2006).

The introduction and establishment of wild turkeys (*Meleagris gallopavo*) into northern California in the 1960's and 1970's, represents a change in the biota. Wild turkeys have become common in the study area and some environmentalists fear that their presence is having negative impacts to populations of native plants (Daniel Gluesencamp, Audubon Canyon Ranch personal communication). There is evidence that a turkey closely related to and possibly conspecific with *M. gallopavo* occurred in Northern California approximately 10,000 years ago (Steadman 1980). If this is the case, then current turkey establishment represents a reintroduction of a native taxon to California. Turkeys may affect the current ecological dynamic and thereby modify native vegetation.

Other Local Floras

One inspiration for the current project was a plant list produced for the John Muir National Historical Site commissioned by the National Park Service (E. Jepsen, P. B. Murdock, and A. G. Murdock unpublished data). In addition, there was a large plant list produced for the environmental assessment of Carquinez Strait Regional Shoreline (comprising a significant portion of the southern section of the study area) based mostly on the work of the East Bay Chapter of the California Native Plant Society (CNPS) volunteers, especially Dianne Lake (Lake 2004). Barbara Ertter's Annotated Checklist of the East Bay Flora (Ertter 1997) includes the

southern portion of the study area in its treatment. The Flowering Plants and Ferns of Mount Diablo, California (Ertter and Bowerman 2002) treats a botanically rich area located approximately 20 km east-southeast of our study area. Other floras of nearby areas that were useful in this study include Marin Flora (Howell et al. 2007), Flora of the Mount Hamilton Range (Sharsmith 1945), A Flora of Sonoma County (Best et al. 1996), Plants of the San Francisco Bay Region: Mendocino to Monterey (Beidleman and Kozloff 2003), A Flora of the Marshes of California (Mason 1957), and Flora of the Santa Cruz Mountains of California (Thomas 1961).

Plant Associations

Prior to this survey, descriptions of vegetation types for Mount Wanda were made by E. Jepsen, P. B. Murdock, and A. G. Murdock (unpublished data) and J. C. Hunter, S. D. Veirs, and P. Reeburg (unpublished data). These types include grassland, blue oak woodland, mixed evergreen forest, chaparral, and ruderal. Our initial surveys were performed to verify this assessment. This information is summarized below, along with descriptions of additional vegetation types (e.g., riparian, brackish marsh) not included in the earlier studies.

Blue oak woodland. Represented by a diverse assemblage of trees and herbaceous plants and has a distinct, well-developed overstory and understory. It typically occurs in north-facing areas of Mount Wanda and in upper portions of drainages. The dominant species in the overstory is blue oak (*Quercus douglasii*), with valley oak (*Quercus lobata*), black oak (*Quercus kelloggii*), and California buckeye (*Aesculus californica*) also well represented. Common understory species include poison oak (*Toxicodendron diversilobum*), ripgut brome (*Bromus diandrus*), Pacific snake-root (*Sanicula crassicaulis*), spring vetch (*Vicia sativa*), canyon nemophila (*Nemophila heterophylla*), chickweed (*Stellaria media*), miner's lettuce (*Claytonia perfoliata*), goose grass (*Galium aparine*), Italian thistle (*Carduus pycnocephalus*), hedgehog dogtail (*Cynosurus echinatus*), wild oats (*Avena fatua*), and field hedge parsley (*Torilis arvensis*).

Mixed evergreen forest. Characterized by denser forest than blue oak woodland. The overstory is significantly more developed than the understory. Mixed evergreen forest generally occurs in lower portions of drainages and on lower, north-facing slopes. Dominant tree species include coast live oak (*Quercus agrifolia*) and California bay (*Umbellularia californica*), with black oak and California buckeye also occurring. Understory species include poison oak, maidenhair fern (*Adiantum jordanii*), California coffeeberry

(*Frangula californica* subsp. *californica*), wood fern (*Dryopteris arguta*), California blackberry (*Rubus ursinus*), hedge nettle (*Stachys rigida* var. *quercetorum*), and Torrey's melic (*Melica torreyana*). In more mesic areas, the understory is enriched with locally uncommon species such as yerba buena (*Clinopodium douglasii*), false Solomon's seal (*Maianthemum stellatum* and *M. canadense*), and madrone (*Arbutus menziesii*).

Chaparral. Consists of shrubs with some herb and tree components. In the study area chaparral is found in isolated patches on the south side and crest of Western Franklin Ridge, Mount Wanda, and at Ozol Rock. The dominant species is chamise (*Adenostoma fasciculatum* var. *fasciculatum*). Other components include California sagebrush (*Artemisia californica*), toyon (*Heteromeles arbutifolia*), sticky monkeyflower (*Mimulus aurantiacus*), coyote mint (*Monardella villosa* subsp. *villosa*), and deer weed (*Acmispon glaber* var. *glaber*). Other represented species include woolly paintbrush (*Castilleja foliolosa*), poison oak, skullcap (*Scutellaria tuberosa*), and western bluegrass (*Poa secunda* subsp. *secunda*).

Northern coastal scrub. Another shrub-dominated vegetation type; this plant association is much more common than chaparral in the study area. The dominant taxa are coyote brush (*Baccharis pilularis* var. *consanguinea*) and poison oak; also, sticky monkeyflower is common. Other less common shrubs include hop tree (*Ptelea crenulata*), California gooseberry (*Ribes californicum* var. *californicum*), California coffeeberry, and (rarely) Western leatherwood (*Dirca occidentalis*). Often, the understory is rich in herbs such as yerba buena, wood fern, California cinquefoil (*Drymocallis glandulosa* var. *wrangelliana*), Pacific snakeroot, canyon nemophila, and bristly phacelia (*Phacelia nemoralis* subsp. *nemoralis*). There is a nearly bare border from 25–35 cm wide separating northern coastal scrub and grassland. This zone provides a unique habitat for annual species, including skunkweed (*Navarretia squarrosa*), thyme-leaf mesamint (*Pogogyne serpylloides*), round woolly-marbles (*Psilocarphus tenellus*), and petalless pearlwort (*Sagina apetala*). Northern coastal scrub is better developed where cattle grazing is limited or excluded.

Riparian. Vegetation along smaller streams and drainages generally consists of mixed evergreen forest. Along larger, perennial streams typical riparian vegetation occurs. Dominant plants include red willow (*Salix laevigata*), arroyo willow (*Salix lasiolepis*), periwinkle (*Vinca major*), Himalayan blackberry (*Rubus bifrons*), and poison oak. Other taxa include California black walnut (*Juglans hindsii*), California grape (*Vitis californica*), Western sycamore (*Platanus racemosa*), Harding grass (*Phalaris aquatica*), and

giant reed (*Arundo donax*). In some drainages, the native woody vegetation has been replaced by blue gum. In these areas, the depauperate understory is a scattering of the plants found in a typical riparian zone, as well as an occasional adventive such as island cherry (*Prunus ilicifolia* subsp. *lyonii*).

Salt marsh/brackish marsh. Occurs in areas that border the Carquinez Strait and San Pablo Bay. The alpha diversity of this habitat is negatively correlated with the salt concentration in the soil. Salinity levels are highest in marshes that are diked and no longer subject to regular tidal flushing. In these areas, pickleweed (*Salicornia pacifica*) dominates the lower elevations. In higher areas at the base of levees, salt grass (*Distichlis spicata*) also occurs. In salt marshes subject to tidal action, these two species are also dominant, but cordgrass (*Spartina foliosa*) may form patches on the margins of the marsh facing open water and alkali heath (*Frankenia salina*) occurs mixed with salt grass in the high marsh. A successful colonizer in these habitats is the introduced perennial peppergrass (*Lepidium latifolium*), an aggressive spreader. In the eastern portion of the study area and near the mouth of the Napa River, there is a greater influx of fresh water leading to brackish rather than salt marsh vegetation. Although the species mentioned above still occur, there are areas dominated by other species, such as California bulrush (*Schoenoplectus californicus*), common reed (*Phragmites australis*), and alkali bulrush (*Bolboschoenus maritimus*). Minor elements that occur in these less saline marshes include hedge bindweed (*Calystegia sepium* subsp. *limnophila*), California sunflower (*Helianthus californicus*), salt-marsh fleabane (*Phuchea odorata* var. *odorata*), western goldenrod (*Euthamia occidentalis*), salt marsh gumplant (*Grindelia stricta* var. *angustifolia*), sea lavender (*Limonium californicum*), and Baltic rush (*Juncus balticus* subsp. *ater*).

Ruderal. Areas that are more accurately described as a habitat than a true vegetation type, but a significant number of plants predominantly occur in such areas. They are disturbed places that include fire roads, trails, roadcuts, and other areas created and consistently impacted by human use. This also includes areas that are regularly disked or mowed as part of a fire-management regime. Disturbance favors fast-growing annuals and plants that can withstand trampling, mowing, soil compaction, and rapid desiccation of surrounding soil. Significant plants include little hop clover (*Trifolium dubium*), annual pepperweed (*Lepidium nitidum*), field burweed (*Soliva sessilis*), bellardia (*Bellardia trixago*), pineapple weed (*Matricaria discoidea*), prickly sow thistle (*Sonchus asper* subsp. *asper*), bristly ox-tongue (*Helminthotheca echinoides*), and filaree (*Erodium* spp.).

Annual grassland. Consists of mostly unshaded areas dominated by introduced grasses and composites. It typically occurs in areas on tops of hills, as well as on south-facing hillsides and valley bottoms. Dominant taxa include: wild oats, black mustard (*Brassica nigra*), rip-gut brome, soft chess (*Bromus hordeaceus*), Italian ryegrass (*Festuca perennis*), foxtail barley (*Hordeum murinum* subsp. *leporinum*), Italian thistle, and yellow star-thistle (*Centaurea solstitialis*). Other significant taxa include common fiddle-neck (*Amsinckia intermedia*), milk-thistle (*Silybum marianum*), cut-leaved geranium (*Geranium dissectum*), crane's-bill geranium (*Geranium molle*), various filarees, and spring vetch. In the northern region of the study area, where grazing has been excluded, the perennial weeds fennel (*Foeniculum vulgare*) and Harding grass are often dominant.

Bunchgrass prairie. Largely confluent with annual grassland and shares some of the same species. Bunchgrass prairie is distinguished from annual grassland in that native, perennial grasses and forbs dominate, rather than introduced, annual ones. On drier sites, the most common native grass is purple needlegrass (*Stipa pulchra*). Foothill needlegrass (*S. lepida*) is more common on hills with fewer dry exposures. Native graminoids that often occur on north-facing hillsides include blue wildrye (*Elymus glaucus* subsp. *glaucus*), squirreltail (*Elymus multisetus*), thingrass (*Agrostis pallens*), and California brome (*Bromus carinatus* var. *carinatus*). In the western portion of the study area, California oatgrass (*Danthonia californica*) and slender rush (*Juncus tenuis*) sometimes occur with the other grasses mentioned. Common forbs include narrow-leaved mule-ears (*Wyethia angustifolia*), blue-eyed grass (*Sisyrinchium bellum*), coyote-mint, gumplant (*Grindelia camporum*), Indian paintbrush (*Castilleja affinis* subsp. *affinis*), and summer lupine (*Lupinus formosus* var. *formosus*).

Freshwater marsh. Currently is restricted in the study area to slow-moving sections of streams. Common species include sneezeweed (*Helenium puberulum*), brown-headed rush (*Juncus phaeocephalus* var. *paniculatus*), mints (*Mentha* spp.), cattails (*Typha* spp.) and California bulrush. Seasonal ponds and vernal pools largely have been eradicated from the study area, but some ditches and puddles support species often associated with vernal pools, such as rough-fruited popcorn flower (*Plagiobothrys trachycarpus*).

MATERIALS AND METHODS

We searched the Consortium of California Herbaria (CCH) website (<http://ucjeps.berkeley.edu/consortium/>) for plant collections that were obtained within the study area, using place names

and names of notable geographic features within the study area. In addition, we searched in some taxonomic groups at the county level to ensure inclusion of specimens collected within the study area. We examined specimens that represented novel reports from the study area in order to confirm their identity. In order to include any relevant specimens from California Academy of Sciences (CAS), at the time minimally represented in the CCH database, we compiled a list of 43 taxa that had not been located in the study area but were potentially present based on nearby occurrences and searched CAS for examples. We also consulted a catalogue of specimens collected by E. L. Greene, who was an important early plant collector in the San Francisco Bay Area. Specimens that were collected from the study area were borrowed from Notre Dame (ND) for identification confirmation.

We collected vascular plants in the study area beginning in October 1996 and ending in December 2010, with most collecting done in 2002 through 2007. We collected in all major habitats and covered all areas that were accessible. We used Google Earth (Europa Technologies Ltd, Surrey, UK) to identify areas that had not yet been covered or that harbored potential unusual vegetation types. We repeatedly visited collection areas over multiple seasons until no new plant taxa were located. We used Google Earth and a Garmin eTREx Summit GPS unit (Garmin International, Olathe, KS) to generate georeference data. See Appendix 1 for the location of common collecting areas. Voucher specimens were deposited in the Jepson Herbarium (JEPS) or the California Department of Food and Agriculture Herbarium (CDA). We predominantly used Hickman (1993) and Flora of North America Editorial Committee (1993+), but also used local floras such as Sharsmith (1945), Thomas (1961), Best et al. (1996), Ertter and Bowerman (2002), and Howell et al. (2007) to identify collections. We classified taxa as rare (collected or observed from three or fewer localities), uncommon (four to nine localities), occasional (10 to 20 localities), common (21 or more localities), or pervasive (found in most localities). The actual number of locality occurrences is likely to be higher for most taxa, but, given the number of sample sites, the observed relative frequency of taxa is likely to remain constant with further sampling.

RESULTS AND DISCUSSION

We found 795 taxa within the study area: 13 ferns, 4 gymnosperms, 3 magnoliids, and 602 eudicots.

Collection History

Unlike some nearby areas that are topographic landmarks (e.g., Mt. Diablo and Mt. Tamalpais),

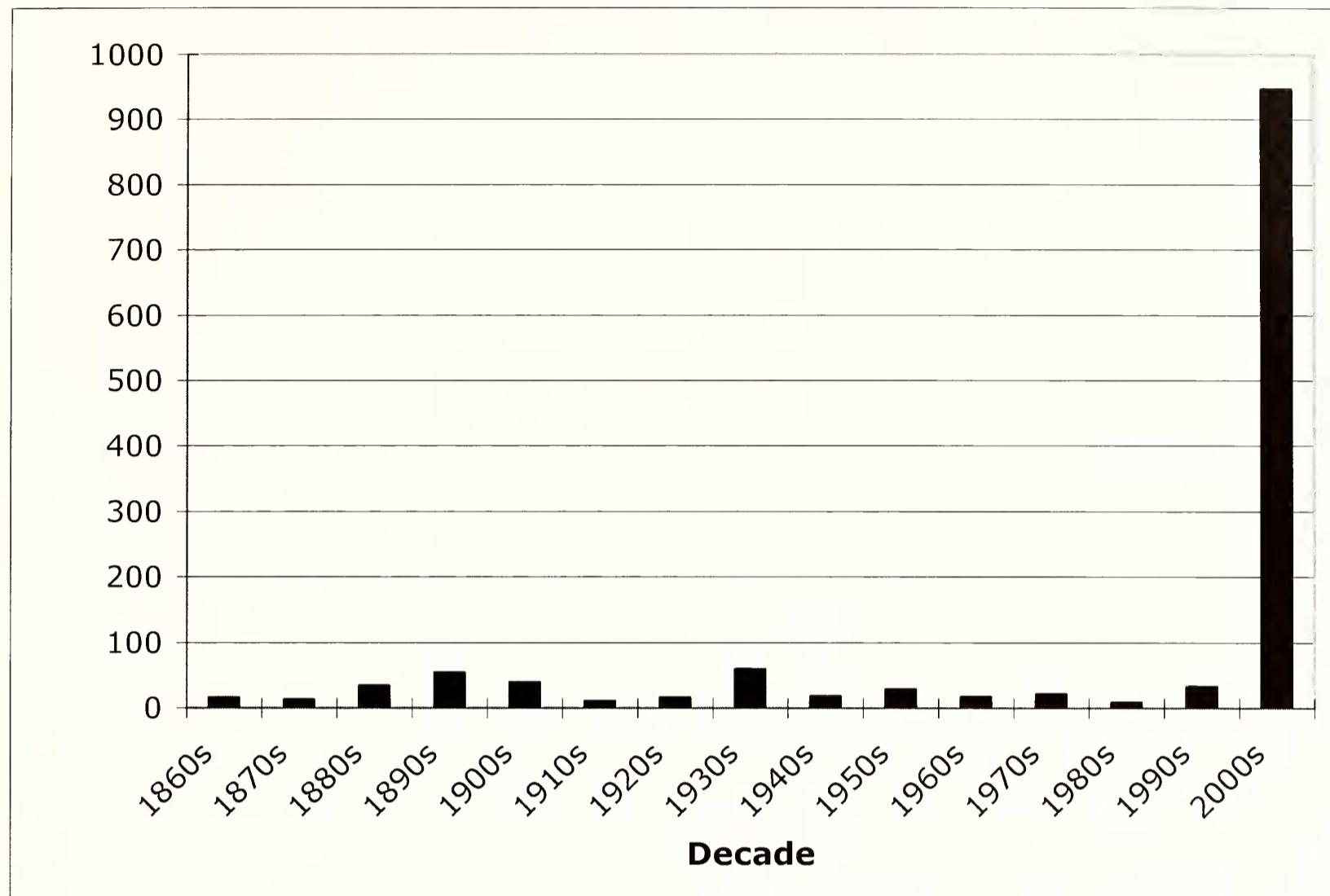


FIG. 2. A histogram of the number of plant collections in the Carquinez Strait Region over time. The numbers are from the Consortium of California Herbaria (<http://ucjeps.berkeley.edu/consortium/>).

the historic plant collections from the study area are modest (Fig. 2). This emphasizes the utility of floristic studies in producing documented locality data even in areas, such as the study area, that are easily accessible to botanists at nearby research institutions. Many of the earliest collections were made near train stations. Martinez has the largest number of collections from the 19th century. These collections, though relatively few, are important, because they document plant species that, in some cases, can no longer be found in the study area (see below). Information on many of these early collections is available through the data provided by the participants of the CCH.

William Brewer was an important early collector of California plants, being the main author of Volume 1 of the botany portion of the Geological Survey of California (Brewer et al. 1876). Most of his collections in Contra Costa County were from Mt. Diablo; within the study area he collected about a dozen taxa near Martinez in April of 1862. Other early collections include 6–7 plants by Carlotta Case at “Muir Station” in July of 1904.

The most important early collector of plants in the study area was Joseph Burtt Davy. He collected about 30 taxa in the southern part of the area (mostly in Martinez) in the late 1800’s and at the turn of the 20th century. These

collections include some plants from the Martinez brackish marsh that no longer grow there, probably due to salinity shifts and habitat degradation.

In the southwestern portion of the study area, Ivar Tidestrom was responsible for collecting a dozen or so specimens of common plants in the area around Crockett in June 1895. In addition, Harvey Monroe Hall collected some two dozen specimens between Point Richmond and Martinez in March 1901. Mary Curran Brandegee concentrated her collecting in the eastern portion of the county in Antioch. Nevertheless, she collected a few specimens in Crockett in 1905, including flowers from an interesting population of *Clarkia*.

E. L. Greene, first professor of Botany at the University of California, collected specimens in the study area, particularly from Vallejo. The type specimens of summer lupine (*Lupinus formosus* Greene) and slender groundsel (*Senecio aphanactis* Greene) are from Mare Island near Vallejo. Greene also collected the type of motoroil plant (*Potentilla frondosa* Greene = *Horkelia californica* var. *frondosa* Greene Ertter & Reveal) near Port Costa. Greene’s successor at the University of California, W. L. Jepson, grew up in eastern Solano County and concentrated his early collecting near Vacaville (northeast of

the study area). After going to Berkeley, much of his local collecting was in the Berkeley Hills and on Mt. Diablo, although he collected two grasses and a legume in Crockett in 1937.

Local Extirpations

Certain plants from early collections can no longer be located within the study area. In some cases, the likely cause is habitat modification. Early collections from the tidal marsh at Martinez included species that are now found only further east. The Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*) and hedge bindweed (*Calystegia sepium* subsp. *limnophila*) are still found approximately 5 km east of Martinez near the eastern border of the study area. Other species are no longer found within the study area, but currently can be found growing together in brackish marshes in Suisun Bay, approximately 18 km to the northeast of Martinez. This includes marsh ragwort (*Senecio hydrophilus*), sea milkwort (*Glaux maritima*), and marsh sneezeweed (*Helenium bigelovii*). In this case, the increased salinity of the marsh at Martinez may be responsible for the local extirpation of some taxa, although loss of high tidal-marsh habitat may also be a factor (H. L. Mason unpublished data).

Because of the fugitive nature of some annual species, it is not possible to determine if certain species no longer evident (e.g., *Pentachaeta alsinoides* and *Minuartia californica*) have disappeared due to habitat degradation or whether their absence is only temporary or apparent (i.e., species may be present in the seed bank, but not as reproductive adults). Nevertheless, in the case of plants adapted to specialized habitats, we may conclude that the habitat no longer exists. Vernal pools were probably never common in the study area, but inference from historic collections of vernal-pool endemics proves that vernal pools occurred in Vallejo and Martinez. The current absence of pools in these highly developed areas indicates that these respective localities for pretty downingia (*Downingia pulchella*) and glue-seed (*Blennosperma nanum* var. *nanum*) are lost forever. In addition, certain species were collected repeatedly in the region in the 19th century, but have largely disappeared today; these regional disappearances are likely due to large-scale landscape changes. Thus, one would be unlikely to relocate California mustard (*Caulanthus lasiophyllum*) or dobie pod (*Tropidocarpum gracile*) in the study area today.

Of the 795 plant taxa found in the area, 463 are native to the region. Approximately 24% (110 taxa) of these are known from only one collection locality within the study area. Another 12% (43 taxa) are known from only two collection localities. Of these locally rare taxa, some are restricted to specialized habitats, such as sema-

phore grass (*Pleurogrammus californicus* var. *californicus*), rough-fruited popcornflower (*Plagiobothrys trachycarpus*), and Contra Costa goldfields (*Lasthenia conjugens*) to vernally wet areas and starflower (*Trientalis latifolia*), red columbine (*Aquilegia formosa*), scarlet larkspur (*Delphinium nudicaule*), and Wight's paintbrush (*Castilleja wightii*) to a particularly mesic canyon along the southern border of the study area. Other plants, such as royal rein-orchid (*Piperia transversa*) and western leatherwood (*Dirca occidentalis*), are sparsely distributed throughout their global range.

Some species reach the very edge of their range in the study area; notable examples are typically coastal species such as lizardtail (*Eriophyllum staechadifolium*), California sheepburr (*Acaena pinnatifida* var. *californica*), black sage (*Salvia mellifera*), and sea-lettuce (*Dudleya farinosa*), and largely interior species such as valley loco-weed (*Astragalus asymmetricus*), blazing-star (*Mentzelia lindleyi*), and three-rayed tarweed (*Hemizonia lobbi*). This coastal/interior gradient explains the limited distribution within the study area of approximately 2% of the taxa.

Endemism

Because of the lack of strong edaphic discontinuity (e.g., no serpentine outcrops) and paucity of isolated, extreme habitats (e.g., mountain peaks), relatively few narrow endemics occur in the study area. Most of the endemics that do occur grow in either tidal brackish marshes or in heavy clay, upland soil.

Brackish marshes. The Carquinez Strait historically represents the major area of mixing between salt water from the Pacific Ocean and fresh water from the Delta. Significant freshwater diversion from the Delta and San Joaquin and Sacramento rivers for agriculture has led to a significant shift in this area of mixing to the east, causing salinity levels in tidal marshes along the Carquinez Strait to increase over time (Conomos 1979). Certain species of plants can tolerate moderate but not high levels of salt. Some of these taxa are endemics in the brackish marshes of the San Francisco Bay and Delta. One such plant is the soft birdsbeak (*Chloropyron molle* subsp. *molle*). The *C. molle* complex includes *C. m.* subsp. *hispidum* and *C. palmatum* of interior saline marshes of the Central Valley, and *C. maritimum* of coastal salt marshes. *Chloropyron molle* subsp. *molle* is found in the highest zone of tidal brackish marshes in the greater San Francisco Bay. All of these taxa are now rare; the soft birdsbeak is federally endangered (U.S. Fish and Wildlife Service 2005). It has declined due to increasing salinity, the loss of high-marsh habitat to filling, and the diking of marshes, that

eliminates tidal action (Hildyard 2001). The Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*) occurs in areas with enough influx of fresh water to support tall reeds and tules. At present, this herbaceous vine grows in the study area only east of the Benicia Bridge; Jepson previously collected it about 20 km to the west in Crockett in 1937. Although not a brackish marsh endemic, Contra Costa goldfields (*Lasthenia conjugens*) is the most salt-tolerant *Lasthenia*, sometimes occurring on the edge of salt marshes (e.g., CDA 8098, west of Suisun, Solano County). Because the habitat of this geographically restricted species has undergone massive development, most of the historic localities have been destroyed. In the study area, it is known from a single locality in a vernal wet field heavily grazed by cattle.

Clay slopes. Colonies of Jepson's eryngo (*Eryngium jepsonii*) grow on patches of dense clay on north-facing slopes along Carquinez Ridge. This species has generally been included in California eryngo (*E. aristulatum*); it differs in its habitat (upland clay slopes vs. wetlands), its larger fruits with large apical scales (M. Park, Univ. of California, Berkeley personal communication), and the bractlets that are barely longer (vs. much longer) than the flowers (Coulter and Rose 1902). Its full range is unknown pending its untangling from its congener, but it also occurs on clay slopes in the Mt. Diablo Area. An associate that often occurs with this species is clay mariposa-lily (*Calochortus argillosus*), another clay endemic that has been confused with a similar species (in this case *C. venustus*).

Other endemics. Santa Cruz tarweed (*Holocarpha macradenia*), an annual in the Asteraceae, had the misfortune to be restricted to fields and low hills around San Francisco Bay and near Santa Cruz. The majority of its habitat has been converted to housing sites. Although never found within the borders of the study area, it was known from an adjacent region to the southwest. There is still a chance that this species will be found in the western portion of the study area in grasslands subject to summer fog.

Western leatherwood (*Dirca occidentalis*) is a shrub that is known only from counties that border San Francisco Bay, where it is very sparsely distributed. Its northeastern distributional limit is within the study area in Edwards Canyon, above the town of Crockett. The rarity of this taxon is difficult to explain; it grows in the ecotone between coastal scrub and mixed evergreen forest, both common plant associations in the San Francisco Bay Area. Its restriction to certain watersheds may indicate that its fruits are subject to limited dispersal.

Mount Diablo fairy lantern (*Calochortus pulchellus*) is a narrow endemic found only in the vicinity of Mt. Diablo, with one known outlying

population within the study area (Ozol Rock, west of Martinez). It is a disjunct, close relative of the yellow fairy lantern (*C. amabilis*) of the Northern Coast Ranges. The study area colony of *C. pulchellus* is the closest population to its sister species; the latter is known from Rockville (Solano County), about 25 km to the north.

Hybridization

Hybridization in plants is often cryptic and its origins hard to detect. Some populations of putative hybrid origin (based on morphological intermediacy and variability) are known from the study area. In the brackish marsh are clones of *Bolboschoenus* (*Scirpus* spp.). Each clone differs slightly morphologically from its neighbors. These populations, named as *Bolboschoenus maritimus* (L.) Palla subsp. *paludosus* (A. Nelson) T. Koyama, resemble intermediates between *B. maritimus* and *B. robustus* and may represent a hybrid swarm. Growing in the same areas is *Grindelia stricta* var. *angustifolia*, a taxon that is a putative hybrid between *G. stricta* var. *angustifolia* and *G. camporum* (Munz and Keck 1968).

The commonest (as measured by coverage) native grass in the study area is a robust, rhizomatous plant generally identified as *Elymus triticoides*. Classic *E. triticoides* comprises smaller (60–80 cm tall), darker green plants that grow along streams and in low-lying areas. Some collections from the study area do seem to match this form (e.g., DGK04.196). Nevertheless, most rhizomatous *Elymus* in the study area are larger (100–120 cm tall), somewhat glaucous, and grow on hillsides. It is likely that these plants represent introgression with the coastal *E. condensatus* (the F₁ hybrid is known as *L. × multiflorus* (Gould) Barkworth & R. J. Atkins). Typical *E. condensatus* has not been found in the study area, but it still occurs on Brooks Island, approximately 10 km to the southwest. Otherwise, almost every intermediate between the typical forms of the two *Elymus* taxa can be seen in the western part of the study area.

Naturalized Plants

More than a third (42%) of the species in the study area are introduced from outside of California. These 331 species range from rare to pervasive. The percentage of introduced plant taxa in the study area is higher than that for the state of California as a whole (42% vs. 25%; Ornduff et al. 2003). This elevated number of introduced taxa may be a result of the relatively disturbed nature of the study area (see Pino et al. 2006). Of eudicots and monocots, 41% (249) and 42% (79), respectively, are adventives introduced since European colonization (denoted in the plant

list by *). Non-native plants are least apparent in plant associations dominated by woody species and in wetlands. In upland, herb-dominated associations, non-native species generally dominate, often constituting over 95% of the canopy cover. Grassland patches dominated by native species do occur within the study area (e.g., Bull Valley Prairie and 5th Street Prairie) but they are rare and relatively small (<0.2 hectares).

Long-established weeds. Some introduced plants seem to be nearing equilibrium where their rate of increase in the study area is relatively low. Some of these plants are locally dominant under some situations and can have a profound effect on the plant community structure. Typical of these taxa are annual grasses, largely from Europe, that dominate most local grasslands. These include bromes (*Bromus* spp.), barleys (*Hordeum* spp.), ryegrasses (*Festuca* spp.), oats (*Avena* spp.), and annual fescues (*Festuca* spp.). Some perennial weeds can be important in grasslands. Fennel (*Foeniculum vulgare*) and Harding grass (*Phalaris aquatica*) are non-native perennial weeds that have invaded non-grazed grasslands extensively, particularly on the north side of the Strait. Because native perennial prairie taxa are lower growing, where fennel and Harding grass are dominant, most native taxa are excluded. This is a particular problem on Mare Island, where fennel and Harding grass are slowly increasing at the expense of native grassland species.

Perennial peppergrass (*Lepidium latifolium*) forms colonies on the edges of salt and brackish marshes. It is particularly well adapted to the high-marsh zones, and it competes for space with plants that are restricted to this zone, such as the federally endangered soft birdsbeak (*Chloropyron molle* subsp. *molle*).

Actively spreading weeds. Some introduced plants, based on past collections as well as current distribution, seem to be actively spreading within the study area. Some of these taxa have been reported from Northern California for decades, but they have been rare or lacking from the study area until recently. Most of these taxa can be expected to expand their range within the study area in the future. Oblong spurge (*Euphorbia oblongata*) is found on lightly shaded hills and on roadsides in the southern portion of the strait. This weedy spurge has been well established in the Sierra Nevada foothills. It is of limited occurrence along the Central Coast, and many of these collections are of relatively recent dates. Within the strait, it has been present since at least 1958 (CDA 4845). Oblong spurge may be an example of an introduced plant that is actively spreading in some areas (e.g., the Central Coast) but has maintained low population numbers in the study area for some time.

Although present in Vallejo since at least 1937 (UC 659018), until recently, bishop's weed (*Anemone majus*) has not been common in the area. It is beginning to appear along major roads and highways within the study area and has come to dominate long stretches of roadside to the north of the study area. It is likely that bishop's weed will soon establish populations south of the strait. Similarly, stinkwort (*Dittrichia graveolens*) was so rare in California in the 1990's that it was not included in the Jepson Manual (Hickman 1993). It has since spread and it is now found in at least 26 California counties. Within the study area, it occurs in all four corners of the region.

Veldt grass (*Ehrharta erecta*) grows in dry shade; it became established in California about 1930 (Stebbins 1985). It often occurs in cracks in pavement, and shady garden conditions may contribute to its spread. Within the study area it is known from Crockett and near Port Costa. These populations, unlike populations in and around Berkeley, may represent the recent expansion of this species into the study area.

Gerard's rush (*Juncus gerardii* subsp. *gerardii*), a plant native to salt marshes in the eastern United States, forms colonies in the upper Southampton and Martinez marshes. The success of this species in these marshes, the only reported California localities, as well as the dispersal opportunities of plants in tidal marshes, indicates that it has a high likelihood of spreading extensively within the San Francisco Bay and Suisun Marsh ecosystems.

KEYS AND SPECIES NOTES

Abbreviations: exc = except; fls = flowers; fr = fruit; frs = fruits; gen = generally; infls = inflorescences; lf = leaf; lflets = leaflets; lvs = leaves; occ = occasionally; pls = plants; w/ = with; w/o = without. Superscripts following family names indicate the number of times the family appears in the key.

Voucher specimens examined are given as the herbarium accession number (in parenthesis) following localities. Localities without voucher specimens represent direct observations by the authors. Herbarium acronyms: JEPS = Jepson Herbarium (Berkeley), CAS = California Academy of Sciences (San Francisco), CDA = California Department of Food and Agriculture (Sacramento), GH = Gray Herbarium (Cambridge, Massachusetts), ND-G University of Notre Dame (Notre Dame, Indiana), SJSU = San Jose State University (San Jose), UCD (University of California (Davis), RSA = Ranch Santa Ana Botanic Garden (Claremont), SD = San Diego Natural History Museum (San Diego), SBBG = Santa Barbara Botanic Garden (Santa Barbara), and UC = University of California (Berkeley), except for those beginning

with DGK (Dean Kelch), AGM (Andy Murdock) and JOMU (John Muir National Historic Site) which are collection numbers in private herbaria. Non-native species are denoted by *. Supplementary material is available online at <http://ucjeps.berkeley.edu/carquinezflora/>.

KEY TO PLANT FAMILIES

1. Pls small (<2 cm); floating aquatics w/ distichous lvs (thalli) 2
- 1' Pls either not small (>2 cm) and/or not a floating aquatic. 3
2. Lvs papillate, red in sun; fertile pls bearing sporangia in large masses . . . Azollaceae
- 2' Lvs (thalli) smooth, green in sun; fertile pls w/ few unisexual fls . . . Araceae² (*Lemna*)
3. Pls bearing free spores produced from sporangia . . . 4
- 3' Pls bearing seeds. 9
4. Sporangia borne on underside of umbrella-shaped structures; photosynthetic structures stems; many whorled, reduced, membranous lvs forming sheaths at nodes. 5. Equisetaceae
- 4' Sporangia borne on underside of lvs; photosynthetic structures lvs, neither whorled nor forming sheaths at nodes. 5
5. Sporangia scattered on undersides of lvs or appearing near lf margins and covered by revolute lf margins Pteridaceae
- 5' Sporangia aggregated in distinct clusters (sori) . . . 6
6. Lvs borne singly along horizontal rhizomes; internodes 10–100 cm long; pls often forming patches; stipes gen >25 cm . . . Dennstaedtiaceae
- 6' Lvs clustered at ends of rhizomes; internodes 0.1–10 cm long; pls single or forming compact clumps; stipes <25 cm . . . 7
7. Sori elongate along veins Blechnaceae
- 7' Sori round to oval. 8
8. Indusia present Dryopteridaceae
- 8' Indusia absent Polypodiaceae
9. Seeds borne on adaxial faces of scales aggregated into cones; lvs needle-like . . . Pinaceae
- 9' Seeds borne within carpels (these only rarely aggregated into cone-like structures); lvs various, rarely needle-like. 10
10. Lvs w/ sheathing bases, veins gen parallel (rarely parallel-veined from central midrib); fl parts gen in 3s 11
- 10' Lvs gen w/o sheathing bases, veins gen reticulate; fl parts gen in 4s or 5s 34
11. Trees w/ woody trunks 12
- 11' Herbs (rarely woody and bamboo-like); lvs <1.2 m long 13
12. Lvs wide, >1.2 m long Arecaceae
- 12' Lvs narrow, sword-like, <1 m long . . . Agavaceae²
13. Perianths showy 14
- 13' Perianths not showy (membranous, reduced, or absent). 25
14. Carpels >8, free Alismataceae
- 14' Carpels 3 (pistils 1), connate 15
15. Fls in heads or umbels. 16
- 15' Fls solitary, or in racemes, spikes, or panicles . . . 18
16. Ovaries inferior. Amaryllidaceae
- 16' Ovaries superior 17
17. Infls subtended by 2 bracts; bulbs present; pls w/ onion odor. Alliaceae

- 17' Infls subtended by 3–8 bracts; corms present; pls w/o onion odor Themidaceae
18. Fls zygomorphic 19
- 18' Fls actinomorphic 20
19. Fls non-resupinate; ovary superior . . . Pontederiaceae
- 19' Fls resupinate; ovaries inferior Orchidaceae
20. Ovaries inferior; lvs ensiform Iridaceae
- 20' Ovaries superior; lvs not ensiform. 21
21. Styles 3 Melanthiaceae
- 21' Styles 1 (occ w/ 3 branches) 22
22. Infls w/ 1–5(12) fls; tepals spotted or not; seeds brown to tan Liliaceae
- 22' Infls w/ (5–)7–>50 fls; tepals unspotted; seeds black if in capsules; tan in berries. 23
23. Stems covered in branchlets resembling needle-like lvs Asparagaceae
- 23' Stems covered w/ lanceolate lvs or foliose bracts 24
24. Pls w/ basal lf rosette; caulin lvs reduced. Agavaceae²
- 24' Pls w/out basal lf rosette; caulin lvs well-developed. Ruscaceae
25. Pls submersed aquatics 26
- 25' Pls not submersed 29
26. Pls marine; fl w/ 1 compound pistil; infls flattened spikes Zosteraceae
- 26' Pls in freshwater or saline ponds; fl w/ 2–6 free carpels; infls not flattened. 27
27. Fls pedunculate, axillary Ruppiaceae
- 27' Fls sessile, axillary or spicate 28
28. Fls spicate; lvs alternate. . . Potamogetonaceae
- 28' Fls axillary; lvs gen opposite . . . Zannichelliaceae
29. Lvs sagittate or ovate Araceae²
- 29' Lvs linear. 30
30. Infls racemes; frs nutlets or follicles. Juncaginaceae
- 30' Infls cymes, heads, or spikes; frs capsules, achenes, or caryopses 31
31. Perianths membranous Juncaceae
- 31' Perianths lacking or reduced to bristles (accessory membranous bracts often present). 32
32. Fls unisexual, lacking subtending bracts but surrounded by fuzzy bristles. . . Typhaceae
- 32' Fls unisexual or bisexual, subtended by bracts. 33
33. Stems solid, often 3-angled; fls each subtended by 1 bract, distichous or spiral in spikelets . . . Cyperaceae
- 33' Stems hollow, cylindrical; fls each subtended by 2 bracts, distichous in spikelets . . . Poaceae
34. Fls w/ 0 or 1 whorl of perianth parts 35
- 34' Fls w/ 2(–3) perianth whorls (sepals rarely falling at anthesis). 71
35. Fls in dense heads subtended by an involucre of bracts; ovary inferior, corollas connate, actinomorphic and/or zygomorphic. . . Asteraceae³
- 35' Infls various (if fl in dense heads, then not subtended by involucral bracts, ovary superior or corollas lacking). 36
36. Pls woody 37
- 36' Pls herbaceous, suffrutescent or weakly woody vines 51
37. Pls aerial stem parasites of trees Viscaceae
- 37' Pls not stem parasites of trees 38
38. Lvs palmate 39
- 38' Lvs pinnate 40
39. Stipules persistent, forming collar around stem; frs dense heads (of achenes). . . Platanaceae
- 39' Stipules caducous; frs lining hollow, spherical, fleshy receptacles (edible). Moraceae

40. Adult lvs opposite 41
 40' Adult lvs alternate 43

41. Frs twinned samaras Sapindaceae²
 41' Frs single samaras or berries 42

42. Stamens 2 or 4; infls not corymbs. Oleaceae²
 42' Stamens 5; infls corymbs Adoxaceae²

43. Fls in vase-like involucres; sepals 6 Polygonaceae²
 43' Fls not in involucres; sepals not 6 44

44. Frs leathery or dry-husked drupes 45
 44' Frs not drupes 46

45. Lvs compound; frs >30 mm Juglandaceae
 45' Lvs simple; frs <10 mm Thymelaeaceae

46. Lf margins minutely serrate 47
 46' Lf margins serrate to entire 48

47. Lf bases notably asymmetric; frs in clusters. Ulmaceae
 47' Lf bases ± symmetric; frs in cones or solitary. Betulaceae

48. Calyces forming cups (calyptra) over fl buds (falling at anthesis) Myrtaceae
 48' Calyces not forming cups. 49

49. Pls dioecious; frs capsules Salicaceae
 49' Pls monoecious; frs nuts or berries 50

50. Fls w/ pedicels; perianths present; frs berries Rhamnaceae²
 50' Fls gen sessile; perianths absent; frs nuts (w/ a cup-shaped involucre) Fagaceae

51. Pls vines 52
 51' Pls not vines 55

52. Fls tubular (sigmoidal); lvs entire. Aristolochiaceae
 52' Fls not tubular; lvs lobed or compound 53

53. Pistils >20; lvs compound Ranunculaceae⁵
 53' Pistils 1; lvs simple 54

54. Corollas not rotate; ovaries superior Vitaceae²
 54' Corollas rotate; ovaries inferior Cucurbitaceae

55. Carpels free 56
 55' Carpels fused 57

56. Lvs fleshy, entire Crassulaceae²
 56' Lvs not fleshy, ternate or deeply lobed. Ranunculaceae⁵

57. Styles 3–12 (rarely inconspicuous). 58
 57' Styles 1–2. 63

58. Lf blades >7 cm; infls fleshy spikes subtended by petaloid bracts. Saururaceae
 58' Lf blades <7 cm; infls not spikes subtended by petaloid bracts 59

59. Pls heterophyllous (w/ divided aquatic lvs and toothed-lobed emersed lvs). Haloragaceae
 59' Pls homophyllous (lf margins entire or toothed). 60

60. Frs utricles or achenes (sometimes winged); fls in dense clusters. 61
 60' Frs capsules; fls solitary or in lax cymes. 62

61. Fls subtended by membranous bracts. Amaranthaceae
 61' Fls subtended by fleshy or rubbery bracts (or no bracts). Chenopodiaceae

62. Pls not fleshy; ovaries superior Caryophyllaceae²
 62' Pls fleshy; ovaries inferior Aizoaceae²

63. Perianth parts showy (sometimes relatively small), white or pink (occ. green) 64
 63' Perianth parts absent or inconspicuous, green. 68

64. Infls usually compound umbels (rarely dense heads or simple umbels) Apiaceae³
 64' Infls not umbels 65

65. Corollas gen zygomorphic; stamens 1–3 Valerianaceae²
 65' Corollas actinomorphic; stamens >3. 66

66. Lvs whorled; frs 2-seeded; pls rarely in marshes Rubiaceae²
 66' Lvs opposite or alternate; frs w/1 or several seeds; often in marshes 67

67. Lvs caudate (occ reduced); fls not terminal. Polygonaceae²
 67' Lvs basal; fls terminal in branched infls. Plumbaginaceae

68. Stamens 1 per staminate fl (fls sometimes clustered tightly) 69
 68' Stamens >1 per staminate fl 70

69. Frs 3-lobed (3-seeded) Euphorbiaceae
 69' Frs 2-lobed, splitting into 4 achene-like units (*Callitricha*). Plantaginaceae³

70. Lvs not pinnately compound to deeply lobed; stipules absent. Urticaceae
 70' Lvs pinnately compound to deeply lobed; stipules present Rosaceae²

71. Perianth parts in 3–4 3-parted whorls Berberidaceae
 71' Perianth parts gen in 2 whorls 72

72. Sepals (calyx lobes) and petals (corolla lobes) of different numbers 73
 72' Sepals (calyx lobes) and petals (corolla lobes) of equal numbers. 79

73. Sepals more than petals (sepals modified into membranous scales or bristles) 74
 73' Sepals fewer than petals (herbaceous or succulent) 75

74. Fls bracts present, much longer than fls; head taller than wide. Dipsacaceae²
 74' Floral bracts 0 or, if present, shorter than fls; head gen shorter than wide. Asteraceae³

75. Sepals 2 76
 75' Sepals 5 78

76. Sepals persistent; pls fleshy. 77
 76' Sepals gen falling at anthesis; pls not fleshy. Papaveraceae

77. Basal rosette lvs present (sometimes obscurely so in *Calandrinia*). Montiaceae
 77' Basal rosette lvs absent Portulacaceae

78. Petals <20; carpels free Ranunculaceae⁵
 78' Petals >40; carpels fused Aizoaceae

79. Pls conspicuously woody 80
 79' Pls herbaceous or suffrutescent 100

80. Lvs opposite 81
 80' Lvs alternate 87

81. Stamens 2 per fl 82
 81' Stamens 4 or more per fl 83

82. Corollas zygomorphic; frs 4 nutlets. Lamiaceae²
 82' Corollas actinomorphic (sometimes reduced); frs not nutlets Oleaceae²

83. Lvs compound or lobed. 84
 83' Lvs not compound or lobed. 85

84. Frs berries Adoxaceae
 84' Frs capsules or paired samaras Sapindaceae²

85. Ovaries superior Phrymaceae²
 85' Ovaries inferior 86

86. Infls umbels; lf tips acute. Cornaceae
 86' Infls panicles; lf tips obtuse to rounded. Caprifoliaceae

87. Pls w/ some unisexual fls; frs samaras 88
 87' Pls bisexual; frs not samaras 89

88. Lvs trifoliolate Rutaceae
 88' Lvs w/ >10 lflets. Simaroubaceae

89. Lvs (or lflets) entire. 90

89' Lvs (or lflets) toothed 93
 90. Frs legumes; fls zygomorphic or, if actinomorphic, stamens >3 length of corolla Fabaceae²
 90' Frs not legumes; fls actinomorphic; stamens $<3 \times$ length of corolla 91
 91. Stems jointed; lvs scales Tamaricaceae
 91' Stems not jointed; lvs not scales 92
 92. Trees; frs single-seeded; lvs w/ strong, spicy fragrance Lauraceae
 92' Herbs or shrubs; frs multiple-seeded; lvs w/o spicy fragrance Solanaceae²
 93. Stamens >10 Rosaceae²
 93' Stamens 10 or fewer 94
 94. Hypanthium present Grossulariaceae
 94' Hypanthium absent 95
 95. Lvs compound Anacardiaceae
 95' Lvs simple 96
 96. Stamens alternate petals 97
 96' Stamens opposite petals 99
 97. Woody vines; lvs lobed Araliaceae
 97' Shrubs or trees; lvs not lobed 98
 98. Corollas urceolate, 5-parted, white . . Ericaceae
 98' Corollas campanulate, 4-parted, green Aquifoliaceae
 99. Shrubs; lvs evergreen Rhamnaceae²
 99' Woody vines; lvs deciduous Vitaceae²
 100. Ovaries inferior 101
 100' Ovaries superior 109
 101. Infls compound umbels; lvs compound or deeply lobed Apiaceae³
 101' Infls not compound umbels; lvs simple or lobed 102
 102. Infls heads, subtended by bracts 103
 102' Infls not heads, not subtended by bracts 105
 103. Bracts subtending heads forming a cup (involute) Asteraceae³
 103' Bracts subtending head not forming a cup 104
 104. Fls zygomorphic Dipsacaceae²
 104' Fls actinomorphic Apiaceae³
 105. Fls 4-parted 106
 105' Fls 5-parted 107
 106. Ovaries much longer than wide; lvs alternate Onagraceae
 106' Ovaries wider than long; lvs whorled Rubiaceae²
 107. Fls zygomorphic, spurred Valerianaceae²
 107' Fls actinomorphic, not spurred 108
 108. Stamens 5 (often connivent); fls blue, purple, and/or white Campanulaceae
 108' Stamens many, divergent; fls yellow Loasaceae
 109. Petals free, falling separately 110
 109' Petals fused (at least at base), falling as a single unit 129
 110. Stamens more than $2\times$ as many as petals 111
 110' Stamens $2\times$ as many as petals or fewer 115
 111. Stamens connate Malvaceae
 111' Stamens not connate 112
 112. Pistils 3-many 113
 112' Pistils 1 (carpels rarely united only at apex) 114
 113. Pistils >10 Ranunculaceae⁵
 113' Pistils 3–5 Crassulaceae²
 114. Lvs alternate; styles 1 Cistaceae
 114' Lvs opposite; styles 3 Hypericaceae
 115. Styles >1 116
 115' Styles 1 122
 116. Ovaries formed of 2 carpels Saxifragaceae
 116' Ovaries formed of 3 or more carpels 117
 117. Petals 3-lobed Resedaceae
 117' Petals entire 118
 118. Frs splitting into 5 single-seeded units Geraniaceae
 118' Frs capsules 119
 119. Lvs trifoliate; infls scapes Oxalidaceae
 119' Lvs simple; infls terminal on leafy branches or fls axillary 120
 120. Pls subshrubs; sepals fused; petals w/ scale appendage at base of limb Frankeniaciae²
 120' Pls herbs; sepals free; petals w/out scale appendage 121
 121. Stamens alternate petals Linaceae
 121' Stamens opposite petals Myrsinaceae
 122. Corollas zygomorphic 123
 122' Corollas actinomorphic 125
 123. Staminal nectar glands present Violaceae
 123' Staminal nectar glands absent 124
 124. Ovary 1-chambered; lvs pinnately or palmately compound Fabaceae²
 124' Ovary 3(–5)-chambered; lvs simple or ternately compound Ranunculaceae⁵
 125. Petals 4 Brassicaceae
 125' Petals 5(–6) 126
 126. Lvs opposite 127
 126' Lvs alternate 128
 127. Pls herbaceous Caryophyllaceae²
 127' Pls woody at base Frankeniaciae²
 128. Lvs simple Lythraceae
 128' Lvs pinnately compound Zygophyllaceae
 129. Fls wind pollinated; corollas membranous Plantaginaceae³
 129' Fls insect pollinated; corollas not membranous 130
 130. Fls zygomorphic 131
 130' Fls actinomorphic 137
 131. Pls viscid; fls >6 cm.; frs w/ 2 horns Martyniaceae
 131' Pls glabrous or glandular, rarely viscid; fls <6 cm; frs w/o horns 132
 132. Lvs serrate; ovules 4; pls aromatic 133
 132' Lvs entire to toothed (rarely serrate); ovules 12- many; pls not aromatic 134
 133. Infls racemes, spikes, or heads Verbenaceae
 133' Infls cymes Lamiaceae²
 134. Pls (hemi)parasitic; lvs lobed, crenately toothed or scale-like Orobanchaceae
 134' Pls not parasitic; lvs entire or toothed, not lobed 135
 135. Stigma lobes flattened, lobes 2 Phrymaceae²
 135' Stigmas unbranched or 2-branched 136
 136. Heads of glandular hairs lacking vertical septae; infls racemes or spikes (if in a condensed thyrse, then fls w/ prominent lower lips) Plantaginaceae³
 136' Glandular hair heads w/ vertical septae; infls thyrses (sometimes condensed into spike-like structures); fls lacking distinct lower lips Serophulariaceae
 137. Stamens opposite petals Primulaceae
 137' Stamens alternate petals 138
 138. Carpels nearly free, united only at apex, surrounded by connivent stamens or by complex androecial structure Apocynaceae
 138' Carpels completely connate, not surrounded by connivent stamens 139

139. Stigma lobes 3; sepal margins gen membranous Polemoniaceae
 139' Stigma lobes 2; sepal margins not membranous 140
 140. Inflorescences helicoid cymes, sometimes lax, obscure; frs capsules or of 4 nutlets Boraginaceae
 140' Inflorescences not helicoid cymes; frs capsules 141
 141. Lvs opposite Gentianaceae
 141' Lvs alternate 142
 142. Pls vines (or sprawling); stigmas 2-lobed Convolvulaceae
 142' Pls herbs or shrubs; stigmas unbranched Solanaceae²

Species By Family

Families are arranged alphabetically within their appropriate sections.

- I. Ferns
- II. Gymnosperms
- III. Magnoliids and Eudicots
- IV. Monocots

I. Ferns

Azollaceae

Azolla filiculoides Lam. Rare. Ponds and ditches. Mare Island; Pig Sale (AGM 311).

Blechnaceae

Woodwardia fimbriata Sm. Rare. Seeps along Pinole and Rodeo creeks. Fernandez Ranch (DGK 05.490).

Dennstaedtiaceae

Pteridium aquilinum (L.) Kuhn. var. *pubescens* Underw. Uncommon. Heads of forested valleys in grasslands above the tree zone. Pinole (AGM 160); Vaca Canyon (AGM 244).

Dryopteridaceae

- 1. Fronds light green, 2-3-pinnate . . . *Dryopteris arguta*
- 1' Fronds dark green, 1-pinnate . . . *Polystichum munitum*

Dryopteris arguta (Kaulf.) (Kaulf.) Maxon. Common. Shade of trees and shrubs. Crockett; Edwards Canyon (DGK 05.190); Franklin Canyon (AGM 205); Mount Wanda (JOMU 4664); Ozol Rock (DGK 04.340).

Polystichum munitum (Kaulf.) C. Presl. Rare. Fernandez Ranch (DGK 05.078); Pinole Creek (DGK 08.015).

Equisetaceae

- 1. Sterile stems with no (few) side branches 2
- 1' Sterile stems with >10 (whorled) side branches *Equisetum telmateia* subsp. *braunii*
- 2. Stems >5 mm diam. *Equisetum hyemale* subsp. *affine*
- 2' Stems <5 mm diam. *Equisetum laevigatum*

Equisetum hyemale L. subsp. *affine* (Engelm.) Calder & Roy L. Taylor. Rare. Glen Cove Pond (DGK 05.288).

Equisetum laevigatum A. Braun. Rare. Along drainage ditch. Vallejo (DGK 05.121).

Equisetum telmateia Ehrh. subsp. *braunii* (Milde) Hauke. Occasional. Along perennial streams. Edwards Canyon (DGK 04.292B); Pinole Creek (DGK 03.130); Rodeo Creek.

Polypodiaceae

Polypodium calirhiza S. A. Whitmore & A. R. Sm. Common. Shaded banks and rocks. Edwards Canyon (UC 440151); Mount Wanda (AGM 71); Rankin Park (DGK 04.004).

Pteridaceae

- 1. Fronds pentagonal in outline, deeply cut, backed with golden meal. *Pentagramma triangularis* subsp. *triangularis*
- 1' Fronds roughly triangular in outline, compound, w/o golden meal. 2
- 2. Fronds irregularly ternately branched, lflets broadly obovate to obdeltate. *Adiantum jordanii*
- 2' Fronds regularly pinnately branched, lflets ovate (*Pellaea*) 3
- 3. Lflets not mucronate *Pellaea andromedifolia*
- 3' Lflets mucronate. *Pellaea mucronata* var. *mucronata*

Adiantum jordanii Müll. Hal. Common. Shaded banks. Edwards Canyon (DGK 05.194); Franklin Canyon (AGM 206); Mount Wanda (JOMU 4691); Tormey (DGK 05.006).

Pellaea andromedifolia (Kaulf.) Fée. Occasional. Rocks and rocky banks. Crockett (UC 399521); Franklin Canyon (AGM 247); Mare Island (AGM 109); Mount Wanda (AGM 68); Ozol Rock (DGK 04.107).

Pellaea mucronata (D. C. Eaton) D. C. Eaton var. *mucronata*. Rare. Mount Wanda; Ozol Rock (DGK 05.280).

Pentagramma triangularis (Kaulf.) Yatsk., Windham & E. Wollenw. subsp. *triangularis*. Common. Banks and in brushy areas. Crockett (UC 399585); Mare Island; Mount Wanda (JOMU 4575); Pinole Creek (DGK 04.022); Vaca Canyon.

II. Gymnosperms

Pinaceae

- 1. Needles gray-green, somewhat drooping; cones >15 cm long *Pinus sabiniana*
- 1' Needles dark green, upright; cones <15 cm long 2
- 2. Needles 2 per fascicle; cone bases nearly symmetric. 3
- 2' Needles (2-)3 per fascicle; cone bases highly asymmetric. *Pinus radiata*
- 3. Tree umbrella-shaped; cones sessile. . . *Pinus pinea*
- 3' Tree excurrent in growth; cones often w/ peduncle. *Pinus halepensis*

**Pinus halepensis* Mill. Rare. Thin soil. Reproducing from nearby plantings. Crockett (DGK 07.582).

**Pinus pinea* L. Rare. Sparingly reproducing from seed near planted groves in the west. Crockett (DGK 05.007).

**Pinus radiata* D. Don. Rare. Reproducing spontaneously by bird-dispersed seed on moister, north-facing hillsides. Franklin Canyon (DGK 05.176).

Pinus sabiniana D. Don. Rare. The gray pine is fairly common in the dry hills east of the study area. Vine Hill (DGK 04.047) (a single waif).

III. Angiosperms

IIIa. Magnoliids and Eudicots

Araliaceae

Saniculus nigra L. subsp. *caerulea* (Raf.) Bolli. [*S. mexicana* C. Presl ex DC.]. Common. In our area the common elderberry is usually a large shrub rather than a tree. Mare Island; Mount Wanda (JOMU 4379); Muir Grave; Muir House; Vaca Canyon.

Aizoaceae

- 1. Annuals; lvs pustulate *Mesembryanthemum nodiflorum*
- 1' Perennials; lvs smooth 2
 - 2. Lvs flat; fls about 1 cm across *Sesuvium verrucosum*
 - 2' Lvs triangular in cross-section; fls >5 cm across *Carpobrotus edulis*

**Carpobrotus edulis* (L.) N. E. Br. Uncommon. Our plants may be hybrids between this species and *C. acinaciformis* (L.) L. Bolus. *C. edulis* has club-shaped buds, usually yellow flowers, and a convex receptacle, while *C. acinaciformis* has oval buds, usually pink flowers, and a flat or concave receptacle. Mare Island (AGM 172); Point Pinole.

**Mesembryanthemum nodiflorum* L. Rare. On fill or nearly bare soil at edges of salt marshes. Mare Island (DGK 05.363); Pacheco Marsh.

Sesuvium verrucosum Raf. Rare. Wet soil at a creek outflow into Lake Herman (DGK 04.235).

Amaranthaceae

- 1. Fls mostly in terminal panicles 2
- 1' Fls mostly in axillary spikes or clusters 4
 - 2. Pistillate fls w/ 3 tepals; frs indehiscent, slightly inflated *Amaranthus deflexus*
 - 2' Pistillate fls w/ 4–5 tepals; frs dehiscent, compressed 3
- 3. Pls nearly glabrous, tepal apices acute *Amaranthus cruentus*
- 3' Pls hairy, tepal apex obtuse *Amaranthus retroflexus*
- 4. Pistillate fls w/ 3 tepals *Amaranthus albus*
- 4' Pistillate fls w/ 4–5 tepals *Amaranthus blitoides*

**Amaranthus albus* L. Uncommon. Disturbed ground. Luzon (AGM 303).

Amaranthus blitoides S. Watson. Rare. Bare, vernal wet soil. Mount Wanda; Muir House.

**Amaranthus cruentus* L. Occasional. Agricultural sites. Crockett (DGK 05.392).

**Amaranthus deflexus* L. Rare. Cultivated areas. Crockett (DGK 05.394).

**Amaranthus retroflexus* L. Uncommon. Disturbed areas. Crockett (DGK 04.286); Muir House.

Anacardiaceae

- 1. Lvs with 3 lflets 2
- 1' Lvs with 5 or more lflets *Schinus terebinthifolius*
 - 2. Terminal lflets sessile; fl stalks stout, upright; frs fuzzy *Rhus aromatica*
 - 2' Terminal lflets stalked; fl stalks slender, pendulous; frs not fuzzy *Toxicodendron diversilobum*

Rhus aromatica Aiton. Rare. Lower slopes of Pinole Peak (DGK 05.098).

**Schinus terebinthifolius* Raddi. Rare. Naturalizes sparingly near plantings. In Southern California, this is a serious weed along perennial streams; in the study area it has not been found in such situations. Rodeo Shore (AGM 201).

Toxicodendron diversilobum (Torr. & A. Gray) Greene. Pervasive. Coastal scrub and near edges of woodlands. The cream-colored flowers are lightly fragrant. Carquinez Scenic Drive; Edwards Canyon; Mare Island; Mount Wanda; Ozol Rock; Vaca Canyon.

Apiaceae

- 1. Inflorescences of few-flowered clusters in axils of opposite lvs *Bowlesia incana*
- 1' Inflorescences of heads or umbels; lvs alternate 2
 - 2. Basal lvs simple to palmately lobed; fls in umbellate heads or simple umbels 3
 - 2' Basal lvs pinnately compound; fls in compound umbels 8
- 3. Lvs grasslike, septate, <5 cm; fls in umbels *Lilaeopsis masonii*
- 3' Lvs not grass-like, non-septate, >5 cm; fls in heads 4
- 4. Fls subtended by spiny bracts; frs w/o hooked hairs (*Eryngium*) 5
- 4' Heads w/o spiny bracts; frs w/ hooked hairs (*Sanicula*) 6
- 5. Bracts subtending infls not lobed *Eryngium armatum*
- 5' Bracts subtending infls lobed *Eryngium jepsonii*
- 6. Annuals, w/ strong smell (like cilantro) *Sanicula bipinnata*
- 6' Perennials, w/o strong smell 7
- 7. Sunny grasslands; petals maroon *Sanicula bipinnatifida*
- 7' Shady or north-facing slopes; petals yellow *Sanicula crassicaulis*
- 8. Basal lvs 1-compound 9
- 8' Basal lvs 2–3-compound 11
- 9. Fl stalks >3 cm diam *Heracleum maximum*
- 9' Fl stalks <3 cm diam 10
- 10. Pls smells of celery; lf segments obovate to cuneate; annuals *Apium graveolens*

10' Pls w/o celery smell; lf segments ovate to lanceolate; perennials. *Berula erecta*

11. Ultimate lf segments narrow, linear to filiform. 12

11' Ultimate lf segments broader, elliptic, ovate, or obovate. 19

12. Frs rod-like, length $>10 \times$ width.
..... *Scandix pecten-veneris*

12' Frs not rod-like, length $<5 \times$ width. 13

13. Infls bracts compound; frs w/ hooked hairs.
..... *Daucus pusillus*

13' Infls bracts simple or lacking; frs w/o hooks. 14

14. Frs winged (*Lomatium*). 15

14' Frs not winged. 17

15. Corollas cream; frs hairy.
..... *Lomatium dasycarpum* subsp. *dasycarpum*

15' Corollas bright yellow; frs glabrous. 16

16. Stem lvs well-developed; lf sheaths often swollen. *Lomatium utriculatum*

16' Stem lvs reduced or lacking; lf sheaths not swollen.
..... *Lomatium caruifolium* var. *caruifolium*

17. Pls w/ anise odor; corollas yellow.
..... *Foeniculum vulgare*

17' Pls w/o anise odor; corollas white. 18

18. Perennials; lf segments linear.
..... *Perideridia kelloggii*

18' Annuals; lf segments filiform.
..... *Cyclospurmum leptophyllum*

19. Corollas yellow. *Tauschia hartwegii*

19' Corollas white. 20

20. Frs with prickles. 21

20' Frs w/o prickles. 23

21. Frs beaked; bractlets $<$ pedicels.
..... *Anthriscus caucalis*

21' Frs not beaked; bractlets $>$ pedicels (*Torilis*). 22

22. Umbels nearly sessile. *Torilis nodosa*

22' Umbels long-pedunculate. *Torilis arvensis*

23. Frs winged. *Angelica californica*

23' Frs not winged. 24

24. Frs elongate, length $>5 \times$ width.
..... *Osmorhiza berteroii*

24' Frs short, length $<3 \times$ width. 25

25. Infl bracts finely divided. *Ammi majus*

25' Infl bracts not divided or lacking. 26

26. Stems purple-dotted; lvs decomound.
..... *Conium maculatum*

26' Stems not dotted; lf segments pinnate. 27

27. Style $<1/3$ length of fr; frs spheric.
..... *Cicuta maculata* var. *bolanderi*

27' Style 1/2 length of fr; frs subcylindric.
..... *Oenanthe sarmentosa*

**Ammi majus* L. Uncommon. Spreading along roadsides. Crockett; Pacheco Marsh (DGK 04.231); Vallejo (DGK 04.269).

Angelica californica Jeps. Rare. Shaded, moist slopes. Edwards Canyon (DGK 03.127); Vaca Canyon (DGK 04.308b).

**Anthriscus caucalis* M. Bieb. Occasional. Hillsides, especially in the east. Mount Wanda (JOMU 4291); Muir House; Ozol Rock (DGK 05.261).

**Apium graveolens* L. Occasional. Salt marshes, especially near freshwater inflow. This is the wild form of the celery of commerce. Mare Island; Martinez Marsh (DGK 04.305).

Berula erecta (Huds.) Coville. Rare. Shallow water and wet soils. Lake Herman (DGK 04.305); Pinole Creek.

Bowlesia incana Ruiz & Pav. Uncommon. North-facing slopes. This plant is inconspicuous and undoubtedly underreported. Cañada del Cierbo; Rodeo Creek (DGK 05.139).

Cicuta maculata L. var. *bolanderi* (S. Watson) G. A. Mulligan. Rare (historic). Benicia (JEPS 15727) (1891), Martinez (UC 20919, 1900).

**Conium maculatum* L. Pervasive. Sunny, disturbed areas. Crockett; Franklin Creek; Mount Wanda.

**Cyclospurmum leptophyllum* (Pers.) Britton & P. Wilson. Rare. Pavement cracks. Hilltop Mall east of Blume Hill (DGK 08.000).

Daucus pusillus Michx. Occasional. In grassland where other vegetation is sparse. Alhambra Valley (JEPS 75521); Edwards Canyon; Mount Wanda; Ozol Rock.

Eryngium armatum (S. Watson) Coulter & Rose. Rare. Low grasslands on the bayshore at Point Pinole (DGK 09.494).

Eryngium jepsonii Coulter & Rose. Rare. This species has been combined previously with *E. aristulatum* Jepson, but differs in its habitat and (subtly) in morphology. It grows on clay lenses on slopes versus the wetland habitat of *E. aristulatum*. It has leaves that are entire to toothed. Outermost bracts are 2× length of inner bracts (vs. outer bracts short and 1–1.5 length of inner) and spines of sepals 1.5–2 mm (vs. 0.5–1 mm). Benicia (CAS 273519); Port Costa Reservoir (DGK 02.003); Vallejo (CAS 84320).

**Foeniculum vulgare* Mill. Pervasive. Ungrazed grasslands, especially north of the strait. Crockett (DGK 07.260); Kite Hill (UC 75496); Mare Island (AGM 103); Mount Wanda (JOMU 4703); Muir House.

Heracleum maximum W. Bartram. Uncommon. Brushy areas subject to coastal fog in the west. Fernandez Ranch; Pinole Creek; Vaca Canyon (AGM 260).

Lilaeopsis masonii Mathias & Constance. Rare. Between the low- and high-tide lines in brackish marshes and salt marshes near river outflows. Occasionally forming a short sod at the water's edge. State-listed as Rare and CA Rare Plant Rank 1B. Mare Island (DGK 05.337); Vallejo shore (DGK 05.297).

Lomatium caruifolium (Hook. & Arn.) J. M. Coulter & Rose. var. *caruifolium*. Rare. Pinole Peak (DGK 05.081).

Lomatium dasycarpum (Torr. & A. Gray) J. M. Coulter & Rose. subsp. *dasycarpum*. Uncommon. Grasslands on steep slopes. Cummings Skyway (DGK 05.275); Ozol Rock (DGK 00.143).

Lomatium utriculatum (Nutt. ex Torr. & A. Gray) J. M. Coulter & Rose. Uncommon. Roadcuts

and grassy hilltops. Mount Wanda (JOMU 4295); Port Costa Reservoir (DGK 07.093); Point Pinole (DGK 05.056).

Oenanthe sarmentosa C. Presl ex DC. Uncommon. Brackish marshes and (rarely) freshwater marshes. Martinez Marsh (DGK 03.100); Pacheco Marsh (AGM 324); Southhampton Marsh (DGK 05.457); Vaca Canyon (DGK 04.160).

Osmorhiza berteroii DC. [*O. chilensis* Hook. & Arn.]. Occasional. Shady understory of forest. Fernandez Ranch (DGK 05.077); Mount Wanda; Vaca Canyon (AGM 263).

Perideridia kelloggii (A. Gray) Mathias. Common. Grasslands. An important food plant of the anise swallowtail butterfly (*Papilio zelicaon* Lucas). The similar *P. oregana* (S. Watson) Mathias should also be sought in the study area. It flowers about a month earlier than *P. kelloggii* (June vs. July) and grows in areas that are wet in spring. Carquinez Scenic Drive (DGK 04.296); Mare Island; Mount Wanda (JOMU 4641).

Sanicula bipinnata Hook. & Arn. Occasional. Steep, grassy slopes. Its distinctive, cilantro-like smell can be detected from meters away. Mare Island (DGK 07.086); Mount Wanda; Ozol Rock (DGK 03.073).

Sanicula bipinnatifida Douglas ex Hook. Uncommon. Sparse grass. McEwen Road (AGM 236); Rankin Park (DGK 03.050); Vine Hill.

Sanicula crassicaulis Poepp. ex DC. Common. Dry shade. Cummings Skyway (DGK 03.367); Mare Island (DGK 07.087); Ozol Rock (DGK 03.057).

**Scandix pecten-veneris* L. Occasional. Grasslands. Cummings Skyway (DGK 03.349); Mount Wanda (JOMU 4301).

Tauschia hartwegii (A. Gray) J. F. Macbr. Rare. One historic specimen, without collector number or date, was attributed to Martinez. It also has been collected to the southeast of the study area in Briones Park (UC 333731), but was not found in the Carquinez Region during the present study.

**Torilis arvensis* (Huds.) Link. Common. Rich soil of roadsides and gardens. Mount Wanda (JOMU 4643); Muir Grave (DGK 05.269); Muir House.

**Torilis nodosa* (L.) Gaertn. Common. Grassy north-facing slopes. Crockett (DGK 05.201); Mare Island; Mount Wanda (JOMU 4303).

Apocynaceae

1. Fls w/ corona, corona and sexual parts displayed above spreading perianth (*Asclepias*) 2
- 1' Fls w/o corona, corollas tubular, hiding sexual parts 4
 2. Lvs linear *Asclepias fascicularis*
 - 2' Lvs broadly ovate 3
3. Lvs woolly, bases rounded *Asclepias speciosa*
- 3' Lvs glabrous, bases cordate *Asclepias cordifolia*

4. Fls <5 mm. *Apocynum cannabinum*
- 4' Fls >10 mm. 5
5. Pls rhizomatous herbs; corollas purple (white) *Vinca major*
- 5' Pls shrubs; corollas red, pink, or white *Nerium oleander*

Apocynum cannabinum L. Rare. Alhambra Creek channel. Muir Grave (DGK 04.306).

Asclepias cordifolia (Benth.) Jeps. Rare. Steep, grassy hills. These collections represent the southernmost collections of this milkweed in the Coast Ranges. Glen Frazer (DGK 09.302); Mount Wanda (JOMU 4309).

Asclepias fascicularis Decne. Uncommon. Grasslands. Locally, this is the most common larval host of the monarch butterfly (*Danaus plexippus* L.). Franklin Canyon (JOMU 4645); Martinez; Mount Wanda (JOMU 4645); Ozol (DGK 06.371).

Asclepias speciosa Torr. Rare. Grasslands. South base of Pinole Peak. (C. Thayer s.n.).

**Nerium oleander* L. Rare. Seeps exposed by deep roadcuts. West of Martinez (CDA 19928).

**Vinca major* L. Common. Shady areas, especially along streams. Persisting from plantings. Edwards Canyon; Muir House (JOMU 4305); Ozol Rock (DGK 05.255).

Aquifoliaceae

**Ilex aquifolium* L. Rare. Riparian areas. Alhambra Creek, Martinez (DGK 05.237).

Araliaceae

**Hedera helix* L. Uncommon. Gardens and occasionally spontaneous in riparian areas. Crockett (DGK 05.373); Martinez.

Aristolochiaceae

Aristolochia californica Torr. (*Isotrema c.* [Torr.] Huber). Occasional. Brushy slopes. In spring it can be detected by watching for the presence of the pipevine swallowtail (*Battus philenor* L.), of which it is the larval food plant. Edwards Canyon; McEwen Rd (DGK 03.034); Mount Wanda (JOMU 4307); Rankin Park (DGK 04.003).

Asteraceae

1. Fls all ligulate (corollas strap-like); pls w/ clear or milky sap 2
- 1' Fls not all ligulate; pls w/ clear sap 19
 2. Lvs mostly basal; cauline lvs lacking or highly reduced 3
 - 2' Lvs basal and cauline or mostly cauline 11
3. Heads solitary, scapose 4
- 3' Heads usually multiple (rarely solitary in depauperate specimens) 8
 4. Receptacles w/ scales *Hypochaeris glabra*²
 - 4' Receptacles w/o scales 5
5. Pappus of membranous scales 6
- 5' Pappus of plumose bristles 7

6. Buds nodding; pappus scales not deciduous *Microseris douglasii* subsp. *douglasii*

6' Buds erect; pappus scales deciduous. *Uropappus lindleyi*²

7. Phyllaries in 2 unequal series, subtended by calyx of shorter bracts *Taraxacum officinale*

7' Phyllaries equal, often in 3–5 series, not subtended by calyx *Agoseris grandiflora* var. *grandiflora*

8. Receptacles w/ scales (*Hypochaeris*). 9

8' Receptacles w/o scales 10

9. Lvs hairy *Hypochaeris radicata*

9' Lvs ± glabrous. *Hypochaeris glabra*²

10. Corollas blue; heads in divaricately branched arrays *Cichorium intybus*

10' Corollas white; heads in candelabra-branched arrays *Rafinesquia californica*

11. Heads >5 cm diam; corollas mauve. *Tragopogon porrifolius*

11' Heads <3.5 cm diam; corollas yellow 12

12. Pappus of membranous scales *Uropappus lindleyi*²

12' Pappus of bristles 13

13. Pappus bristles plumose. 14

13' Pappus bristles not plumose. 16

14. Corollas yellow. *Helminthotheca echinoides*

14' Corollas pink to lavender (*Stephanomeria*) 15

15. Frs grooved *Stephanomeria elata*

15' Frs not grooved. *Stephanomeria virgata* subsp. *pleurocarpa*

16. Frs beaked; involucres cylindric (*Lactuca*). 17

16' Frs not beaked; involucre urceolate (*Sonchus*) 18

17. Annuals; caudine lvs w/ narrow basal lobes. *Lactuca serriola*

17' Biennials; caudine lvs clasping. *Lactuca virosa*

18. Lf basal lobes pointed *Sonchus oleraceus*

18' Lf basal lobes round *Sonchus asper* subsp. *asper*

19. Pls usually spiny; corollas deeply lobed, the lobes linear; receptacle bristly. 20

19' Pls rarely spiny; corollas shallowly lobed, the lobes deltoid; receptacle naked 28

20. Corollas yellow; pappus of membranous scales *Carthamus creticus*

20' Corollas yellow, pink, or purple; pappus of bristles 21

21. Lvs not spiny (*Centaurea*) 22

21' Lvs spiny 24

22. Corollas pink *Centaurea calcitrapa*

22' Corollas yellow. 23

23. Involucral spines 3–5 mm *Centaurea melitensis*

23' Involucral spines 10–15 mm *Centaurea solstitialis*

24. Pappus plumose 25

24' Pappus not plumose 26

25. Lvs green; corollas pink. *Cirsium vulgare*

25' Lvs silvery; corollas purple *Cynara cardunculus* subsp. *flavescens*

26. Heads single; corollas purple. *Silybum marianum*

26' Heads clustered; corollas pink (*Carduus*) 27

27. Heads 2–5 per cluster; corollas purplish-pink *Carduus pycnocephalus* subsp. *pycnocephalus*

27' Corollas heads 5–20 per cluster; corollas light to medium pink *Carduus tenuiflorus*

28. Ray fls absent or inconspicuous 29

28' Ray fls present, conspicuous 66

29. Pappus of capillary bristles 30

29' Pappus of scales, awns, or absent 49

30. Pappus bristles 3; annuals. *Pentachaeta alsinoides*

30' Pappus bristles >5; annuals or perennials 31

31. Pls dioecious; lvs 3-veined from base (*Baccharis*). 32

31' Pls monoecious; lvs usually 1-veined from base (5–7-veined in *Delairea*) 33

32. Perennial herbs (rhizomatous). *Baccharis glutinosa*

32' Shrubs. *Baccharis pilularis* subsp. *consanguinea*

33. Phyllaries in 2 ± equal series, sometimes subtended by calyx of shorter bracts 34

33' Phyllaries in 3–6 usually unequal series, not subtended by calyx 40

34. Pls vining *Delairea odorata*

34' Pls not vining (*Senecio*) 35

35. Heads >1 cm long; corollas white to pale yellow *Senecio glomeratus*

35' Heads <1 cm long; corollas yellow. 36

36. Basal lvs broadly lanceolate, not lobed 37

36' Basal lvs ovate, lobed 38

37. Pls hairy; woodlands *Senecio aronicoides*

37' Pls glabrous; brackish marshes. *Senecio hydrophilus*

38. Calyx conspicuous, bracts black-tipped *Senecio vulgaris*

38' Calyx lacking or inconspicuous, bracts not black-tipped 39

39. Pls coarse; of brush or woodlands; fl heads 12–24. *Senecio sylvaticus*

39' Pls delicate; of alkaline flats; fl heads 4–10(+). *Senecio aphanactis*

40. Phyllaries <1 mm diam. 41

40' Phyllaries >2 mm diam. 42

41. Midveins of phyllaries brown, resin-filled *Erigeron canadensis*

41' Midveins of phyllaries green to purple, not resin-filled *Erigeron bonariensis*

42. Phyllaries foliaceous 43

42' Phyllaries membranous 44

43. Corollas purple. *Pluchea odorata* var. *odorata*

43' Corollas yellow. *Isocoma menziesii* var. *menziesii*

44. Phyllaries brown to purple; fl heads in spikes. *Gamochaeta pensylvanica*

44' Phyllaries white, yellow, or pink; fl heads in panicles or corymbs (*Pseudognaphalium*). 45

45. Lvs green on top; pls notably glandular 46

45' Lvs white on top; pls not notably glandular 47

46. Phyllaries pink; annuals. *Pseudognaphalium ramosissimum*

46' Phyllaries white; pls biennials or perennials. *Pseudognaphalium californicum*

47. Perennials; fl heads pointed *Pseudognaphalium beneolens*

47' Annuals or biennials; fl heads blunt 48

48. Pappus bristles falling singly *Pseudognaphalium stramineum*

48' Pappus bristles falling in clusters *Pseudognaphalium luteoalbum*

49. Heads borne in (sometimes leafy) racemes or panicles 50

49' Heads solitary or in cymes or clusters 57

50. Frs enclosed in involucre with spines or knobs; heads unisexual 51

50' Frs not enclosed in spiny involucres; heads bisexual. 54

51. Fr spines hooked (*Xanthium*) 52

51' Fr spines not hooked (*Ambrosia*) 53
 52. Pl stems spiny *Xanthium spinosum*
 52' Pl stems not spiny *Xanthium strumarium*
 53. Fr spines scattered; lvs silvery
 *Ambrosia chamissonis*
 53' Fr spines on upper half, often vestigial; lvs pale green *Ambrosia psilostachya*
 54. Pls not aromatic; lvs entire *Iva axillaris*
 54' Pls aromatic; lvs toothed to pinnatifid (*Artemisia*) 55
 55. Shrubs; lf lobes filiform *Artemisia californica*
 55' Herbs (rhizomatous); lf lobes broader than filiform 56
 56. Perennials; lvs w/ 0–4 pairs of lobes
 *Artemisia douglasiana*
 56' Annuals; lvs w/ 4–8 pairs of lobes
 *Artemisia biennis*
 57. Heads solitary or in lax cymes; pls glabrous or soft hairy 58
 57' Heads in clusters; pls (sparsely hairy to) woolly 61
 58. Heads much wider than tall
 *Cotula coronopifolia*
 58' Heads taller than wide 59
 59. Heads cylindric; involucral bracts free
 *Achyranthes mollis*²
 59' Heads oval; involucral bracts fused 60
 60. Lvs divided *Matricaria discoidea*
 60' Lvs not divided *Lasthenia glaberrima*
 61. Lvs pinnatifid; frs spiny at apex *Soliva sessilis*
 61' Lvs simple; frs not spiny 62
 62. Chaff scales or tips spreading in fr, forming star-like structure 63
 62' Chaff scales hooded, not spreading in fr 65
 63. Lvs spatulate; pappus absent
 *Hespereanax sparsiflora* var. *sparsiflora*
 63' Lvs linear to narrowly obovate; pappus present (*Logfia*) 64
 64. Lvs acicular, stiff *Logfia gallica*
 64' Lvs linear to obovate, flexible
 *Logfia filaginoides*
 65. Pl short woolly *Psilocarphus tenellus*
 65' Pl long woolly
 *Micropus californicus* var. *californicus*
 66. Receptacles w/ bracts among disk fls (at least one ring of bracts between ray and disk fls) 67
 66' Receptacles naked 88
 67. Phyllaries in 1 series 68
 67' Phyllaries in 2–8 series 80
 68. Ray frs obcompressed, each (mostly) enclosed by phyllary 69
 68' Ray frs compressed to terete, each 1/2 enclosed by phyllary 71
 69. Heads cylindric; rays inconspicuous
 *Achyranthes mollis*²
 69' Heads ovoid to campanulate; rays showy 70
 70. Ray fls 5; disk fls 6 *Lagophylla ramosissima*
 70' Ray fls 6–12; disk fls 28–100+
 *Layia chrysanthemoides*
 71. Phyllaries bulging, forming high, narrow ridges; frs compressed (*Madia*) 72
 71' Phyllaries not or little bulging, forming low or no ridges; frs terete 75
 72. Ray limb >2 × longer than phyllaries, >1 cm, yellow w/ purple blotch *Madia elegans*
 72' Ray limb <2 × longer than phyllaries, <1 cm, yellow 73
 73. Heads wider than tall; pls 3–6(10) cm
 *Madia exigua*
 73' Heads taller than wide; pls 8–80 cm 74
 74. Stems glandular throughout *Madia sativa*
 74' Stems glandular distally *Madia gracilis*
 75. Ray corollas white (yellow) w/ purple adaxial lines; fr beaks short or lacking
 *Heimizonia congesta* subsp. *lutescens*
 75' Ray corollas yellow w/o purple lines; fr beaks longer than wide 76
 76. Lvs spine-tipped
 *Centromadia pungens* subsp. *pungens*
 76' Lvs not spine-tipped 77
 77. Phyllaries w/ apical pit glands (*Holocarpha*) 78
 77' Phyllaries w/o apical pit glands (*Deinandra*) 79
 78. Pls > 30 cm; fl heads < 5 mm diam
 *Holocarpha heermannii*
 78' Pls < 18 cm; fl heads > 6 mm diam
 *Holocarpha macradenia*
 79. Ray fls 3–4 *Deinandra lobbia*
 79' Ray fls 15–35 *Deinandra corymbosa*
 80. Lvs finely divided; pls strongly scented 81
 80' Lvs not finely divided; pls not strongly scented 82
 81. Perennials; fl heads borne in compound umbels *Achillea millefolium*
 81' Annuals; fl heads borne singly or in lax cymes *Anthemis cotula*
 82. Lvs mostly cauline, alternate or opposite 83
 82' Basal lvs larger than cauline; lvs alternate 86
 83. Pls delicate annuals; lvs alternate
 *Rigiopappus leptocladus*
 83' Pls robust annuals or perennials; all or proximal lvs opposite 84
 84. Lvs compound *Bidens frondosa*
 84' Lvs simple (*Helianthus*) 85
 85. Perennials; wetlands *Helianthus californicus*
 85' Annuals; uplands *Helianthus annuus*
 86. Fr edges rounded; lvs subtending phyllaries relatively large *Helianthella castanea*
 86' Fr edges sharp-angled; lvs subtending phyllaries relatively small or absent (*Wyethia*) 87
 87. Lvs <6 cm diam *Wyethia angustifolia*
 87' Lvs >10 cm diam *Wyethia helenioides*
 88. Ray corollas white, pink, or lavender 89
 88' Ray corollas yellow to orange 96
 89. Ray corollas >3 mm diam *Leucanthemum vulgare*
 89' Ray corollas <2 mm diam 90
 90. Lvs basal; fl heads solitary, scapose
 *Bellis perennis*
 90' Lvs basal and cauline; fl heads on branched infls 91
 91. Pappus of short outer setae and inner longer bristles (*Erigeron*) 92
 91' Pappus of ± = bristles 93
 92. Glandular, few-branched annuals (short-lived perennials); wetlands
 *Erigeron philadelphicus* var. *philadelphicus*
 92' Non-glandular, multi-branched perennials; uplands
 *Erigeron foliosus* var. *franciscensis*
 93. Annuals; heads <10 mm diam
 *Synphytum subulatum* var. *ligulatum*
 93' Perennials; heads >10 mm diam 94
 94. Proximal lvs broadly obovate, coarsely toothed *Eurybia radulina*

94' Proximal lvs narrowly lanceolate to oblanceolate, entire to finely toothed. 95
 95. Hairs on stems in lines *Symphyotrichum lanceolatum* var. *hesperium*
 95' Hairs on stems scattered *Symphyotrichum chilense*
 96. Phyllaries in 1 series 97
 96' Phyllaries in 3–7 series 107
 97. Perennials; heads clustered (*Eriophylhum*) 98
 97' Annuals; heads borne singly 99
 98. Fl head clusters <4 cm across; caudine lvs 1–7 cm *Eriophylhum confertiflorum* var. *confertiflorum*
 98' Fl heads clusters >4 cm across; caudine lvs 5–20 cm *Eriophylhum staechadifolium*
 99. Frs obviously curved (*Calendula*) 100
 99' Frs ± straight 101
 100. Fl heads nodding in fr; ray corollas ~ 1 cm long *Calendula arvensis*
 100' Fl heads erect in fr; ray corollas >1 cm long *Calendula officinalis*
 101. Lvs opposite (*Lasthenia*) 102
 101' Lvs all or mostly alternate 106
 102. Phyllaries free 103
 102' Phyllaries partly fused 105
 103. Middle lvs entire
 *Lasthenia californica* subsp. *californica*
 103' Middle lvs pinnately lobed 104
 104. Pappus of awns *Lasthenia platycarpa*
 104' Pappus of awns mixed w/ short scales
 *Lasthenia fremontii*
 105. Phyllaries fused <1/2 *Lasthenia conjugens*
 105' Phyllaries fused >2/3
 *Lasthenia glabrata* subsp. *glabrata*
 106. Pls w/ few or no hairs
 *Blemosperma nanum* var. *nanum*
 106' Pls woolly *Monolopia major*
 107. Lvs opposite; pls succulent *Jaunea carnosa*
 107' Lvs alternate; pls not succulent 108
 108. Heads >1 cm diam 109
 108' Heads <1 cm diam 115
 109. Pappus of scales (*Helenium*) 110
 109' Pappus of awns or bristles 111
 110. Stems winged *Helenium puberulum*
 110' Stems not winged *Helenium bigelovii*
 111. Pappus of readily deciduous awns; buds often pooling a white, sticky latex (*Grindelia*) 112
 111' Pappus of persistent bristles; buds w/o latex (*Heterotheca*) 114
 112. Shrubs > 1 m (evergreen)
 *Grindelia stricta* var. *angustifolia*
 112' Perennials < 80 cm 113
 113. Stems beige, shiny *Grindelia camporum*
 113' Stems reddish, not shiny *Grindelia hirsutula*
 114. Single-stemmed herbs, gen annual; fl heads on long stem *Heterotheca grandiflora*
 114' Multi-stemmed perennials; fl heads nestled in lvs
 *Heterotheca sessiliflora* subsp. *bolanderi*
 115. Anthers short-tailed at base; pls w/ citrus-smelling resin *Dittrichia graveolens*
 115' Anthers not tailed; pls w/o strong odor, not resinous 116
 116. Lvs linear, margins entire
 *Euthamia occidentalis*
 116' Lvs ovate, margins toothed
 *Solidago velutina* subsp. *californica*

Achillea millefolium L. Common. Grasslands and high brackish marsh; especially predominant in areas dominated by native bunchgrasses. Mare Island (DGK 06.148); Martinez Marsh (DGK 03.102); Mount Wanda (JOMU 4311); Port Costa (UC 1301055) (1889); Rodeo Creek (DGK 05.152).

Achyrrachaena mollis Schauer. Uncommon. Disturbed, often heavily grazed, grasslands. Franklin Creek (DGK 05.153); Luzon (DGK 05.230); Mount Wanda (JOMU 4313).

Agoseris grandiflora (Nutt.) Greene var. *grandiflora*. Occasional. Steep banks and other areas where competition from grasses is light. Bull Valley (DGK 04.211); Mount Wanda (JOMU 4315); Ozol Rock (DGK 05.259); Vallejo (SJSU 10573).

Ambrosia chamissonis (Less.) Greene. Rare. Sandy beaches. Rodeo Shore (DGK 04.312).

Anibrosia psilostachya DC. Occasional. Grasslands adjacent to salt marshes. Mare Island (AGM 180); Rodeo Point (DGK 03.080); Southampton Marsh (DGK 03.146).

**Anthemis cotula* L. Occasional. Along roads and in disturbed areas. Carquinez Scenic Drive; Luzon (AGM 302).

**Artemisia biennis* Willd. Rare. Freshwater wetlands. Alhambra Valley (DGK 10.442); Refugio Valley (DGK 10.442).

Artemisia californica Less. Occasional. Steep hills and cliffs where soil is thin. Cañada del Cierbo (DGK 05.361); Mare Island (AGM 102); Ozol Rock (DGK 03.048); Rankin Park (DGK 04.007).

Artemisia douglasiana Besser. Common. Along streams. Mount Wanda (JOMU 4704); Muir Grave; Pinole Creek (DGK 03.139); Point Pinole; Selby.

Baccharis glutinosa Pers. Common. Along streams flowing west into the Bay. Cañada del Cierbo (DGK 03.138); Fernandez Ranch; Mare Island (AGM 186); Muir House; Pacheco Marsh (DGK 04.337).

Baccharis pilularis DC. subsp. *consanguinea* (DC.) C. B. Wolf. Pervasive. Coastal scrub and invasive in grasslands and disturbed areas. Carquinez Scenic Drive; Crockett; Fernandez Ranch; Mare Island; Martinez (JOMU 4758); Pacheco Marsh (DGK 08.290).

**Bellis perennis* L. Rare. Rough lawns in the west. Vallejo (DGK 05.111).

Bidens frondosa L. Rare. Edge of brackish marshes. This perennial should be searched for in other similar habitats. Mare Island (AGM 162).

Blennosperma nanum (Hook.) S. F. Blake var. *nanum*. Rare (historic). Martinez (UC 34577, 1902), presumably from a vernal pool. This locality is no longer extant.

**Calendula arvensis* L. Rare. Disturbed and grazed areas. Glen Cove Shore (DGK 05.292); McEwen Road (DGK 05.040).

**Calendula officinalis* L. Rare. Occasionally spontaneous from garden plantings. Crockett; Benicia (CDA 6858).

**Carduus pycnocephalus* L. subsp. *pycnocephalus*. Pervasive. Where cattle congregate and in disturbed ground. Carquinez Scenic Drive; Mount Wanda (JOMU 4317); Vallejo (CDA 6867).

**Carduus tenuiflorus* Curtis. Rare. Where cattle congregate and in disturbed ground. Edwards Canyon (DGK 01.025); Mare Island (DGK 05.344).

**Carthamus creticus* L. Rare. Disturbed grassland. Lake Herman (DGK 04.245); Vallejo (CDA 6943).

**Centaurea calcitrapa* L. Pervasive. Grasslands where cattle congregate. Benicia (CDA 1093); Edwards Canyon; Mount Wanda (JOMU 4707); Selby (DGK 04.281).

**Centaurea melitensis* L. Uncommon. Slopes. Mount Wanda; Ozol Rock (DGK 05.281); Pinole Peak (AGM 286).

**Centaurea solstitialis* L. Pervasive. Grasslands and roadsides. This Mediterranean annual initially invades an area via roads and disturbed areas, but it will eventually invade and even dominate grassland. Once established in an area, it is very difficult to eradicate. Benicia; Bull Valley; Crockett (UC 894356); Mare Island; Mount Wanda (JOMU 4648).

**Centromadia pungens* (Hook. & Arn.) Greene subsp. *pungens* (*Hemizonia* p. [Hook & Arn.] Torr. & A. Gray subsp. p.). Rare. Under the Carquinez Bridge, Crockett, where it was introduced in hay bales, but did not persist (DGK 04.288). This taxon is known from an historic collection from Pacheco to the southeast of the study area (UC 523551, 1900).

**Cichorium intybus* L. Common. Roadsides. Mare Island (AGM 161); Mount Wanda (JOMU 4650).

**Cirsium vulgare* (Savi) Ten. Common. Scattered along streams and in other moist areas. Carquinez Scenic Drive (DGK 04.298); Crockett (DGK 01.036); Mare Island (DGK 05.359); Mount Wanda (JOMU 4709); Muir Grave.

**Cotula coronopifolia* L. Common. Wet mud on the edges of marshes and ponds. Luzon (AGM 232); Mare Island (DGK 05.023); Martinez Marsh (DGK 03.114); Point Pinole (DGK 05.212b). *Cotula australis* (Spreng.) Hook. f., a tiny annual with deeply divided (as opposed to coarsely lobed) leaves, should be looked for in gardens and roadsides.

**Cynara cardunculus* L. subsp. *flavescens* Wiklund. Occasional. Disturbed and grazed areas. Not spreading rapidly in the study area, but persisting where established. Crockett (AGM 455); Mount Wanda (JOMU 4652); Port Costa (UCD 33766).

Deinandra corymbosa (DC.) B. G. Baldwin (*Hemizonia* c. [DC.] Torr. & A. Gray). Rare. Grasslands in the west. Cañada del Cierbo (DGK 04.179); Point Pinole (CAS 627785).

Deinandra lobbii (Greene) Greene [*Hemizonia* l. Greene]. Rare. Grasslands in the west. Often found with *D. corymbosa*. Cañada del Cierbo (DGK 04.178); Rodeo (JEPS 62625).

**Delairea odorata* Lem. [*Senecio mikanioides* Otto ex Walp.]. Rare. Brushy areas. Possibly beginning to spread. Cummings Skyway (DGK 05.140).

**Dittrichia graveolens* (L.) Greuter. Occasional. Roadsides and broken pavement. This late blooming, European annual was unknown from the area 15 years ago. Now it is locally common along roads and in paving cracks; the fragrance is similar to native tarweeds. Mare Island (AGM 185); Mount Wanda (DGK 05.489); Pacheco Marsh; Selby (DGK 04.346).

**Erigeron bonariensis* L. (*Conyza* b. [L.] Cronquist). Common. Along roads and streams. Cummings Skyway (DGK 03.362); Martinez Train Station (DGK 03.119); Mount Wanda (JOMU 4752).

Erigeron canadensis L. (*Conyza* c. [L.] Cronquist). Uncommon. Moist areas. Pacheco Marsh (DGK 04.331).

Erigeron foliosus Nutt. var. *franciscensis* G. L. Nesom. Rare. Lightly shaded, rocky slopes. Mount Wanda (JOMU 4646).

Erigeron philadelphicus L. var. *philadelphicus*. Rare. Freshwater marshes heavily disturbed by cattle. McEwen Road (AGM 251).

Eriophyllum confertiflorum (DC.) A. Gray var. *confertiflorum*. Occasional. Well-drained slopes. Edwards Canyon; Mount Wanda (JOMU 4321); Ozol Rock; Selby.

Eriophyllum staechadifolium Lag. Rare. Steep hill just west of Crockett (DGK 04.218), where it grows mixed with *E. confertiflorum* (with heads <3 mm vs. >4 mm diameter). This is the most interior known population of this taxon, otherwise found on dunes, coastal bluffs, and in coastal scrub.

Eurybia radulina (A. Gray) G. L. Nesom [*Aster radulinus* A. Gray]. Occasional. Understory of woodlands or under scrub on north-facing slopes. This species blooms in August or September. Although most plants have few flower heads, certain clones with 20 or more flower heads per stem occur. Benicia (UC 127614); Edwards Canyon (DGK 07.375); Mount Wanda; Ozol Rock (DGK 04.116).

Euthamia occidentalis Nutt. Uncommon. Brackish marshes. Pacheco Marsh (DGK 04.309); Southampton Marsh (DGK 03.145).

Gamochaeta pensylvanica (Willd.) Cabrera [*Gnaphalium pensylvanicum* Willd.]. Rare. Edwards Canyon (DGK 04.172b); Mare Island (DGK 04.085).

Grindelia camporum Greene. Common. Grasslands and occasionally on roadsides. Benicia

(JEPS 41869); Mare Island (AGM 101); Martinez (DGK 05.243); Pinole Peak (AGM 284); Selby (DGK 04.280).

Grindelia hirsutula Hook. & Arn. Uncommon. Grasslands. Mare Island; Martinez Marsh; Pacheco Marsh; Point Pinole (CAS 7785).

Grindelia stricta DC. var. *angustifolia* (A. Gray) M. A. Lane. Uncommon. Tidal brackish marshes. This taxon is possibly of hybrid origin (*G. stricta* × *G. camporum*). Mare Island (AGM 193); Martinez Marsh (DGK 03.103).

Grindelia stricta DC. var. *stricta*. Uncommon. A tall shrub in salt marshes and adjacent areas. Benicia; Mare Island (DGK 05.348); Point Pinole (DGK 06.367).

Helenium bigelovii Torr. & A. Gray. Rare (historic). Tidal brackish marshes. Martinez Marsh (UC 80320, 1893). This marsh evidently is now saltier in character due to freshwater diversion upstream.

Helenium puberulum DC. Occasional. Along perennial streams and in seeps. Christie; Lake Herman (DGK 04.258); Muir Grave; Pinole Creek (DGK 03.134).

Helianthella castanea Greene. Uncommon. Brushy slopes and hills. Often mistaken for *Wyethia angustifolia*, but differs in its rounded vs. angled fruits. The two species grow sympatrically on the Selby headlands. CA Rare Plant Rank 1B. Mount Wanda (JOMU 4327); Pinole Valley (DGK 04.032); Martinez (JEPS 96539).

**Helianthus annuus* L. Rare. Along Route 4 in Martinez.

Helianthus californicus DC. Uncommon. Brackish marshes. It is also found in freshwater wetlands, but not within the study area. Pacheco Marsh (DGK 04.310); Point Pinole (JEPS 78634).

**Helminthotheca echioides* (L.) Holub [*Picris e.* L.] Pervasive. Disturbed areas. Mare Island; Mount Wanda (JOMU 4716); Muir House.

Hemizonia congesta DC. subsp. *lutescens* (Greene) Babo. & H. M. Hall. Occasional. Grasslands. Benicia (DGK 05.324); Cañada del Cierbo; Carquinez Scenic Drive (DGK 04.294); Luzon; Vallejo (DGK 04.268).

Hesperevax sparsiflora (A. Gray) Greene var. *sparsiflora*. Occasional. Thin soil. Benicia Hills (JEPS 33805); Edwards Canyon (DGK 05.203); Fernandez Ranch (DGK 05.091); Ozol Rock (DGK 04.124).

Heterotheca grandiflora Nutt. Common. Roadsides. Often flowering from summer into the late year. Pinole (JEPS 20381); Vine Hill (DGK 04.052).

Heterotheca sessiliflora (Nutt.) Shinners subsp. *bolanderi* (A. Gray) Semple. Uncommon. Thin soils in the west. Cañada del Cierbo; Mare Island (AGM 94); Selby headlands.

Holocarpha heermannii (Greene) D. D. Keck. Common. Grazed grasslands. Martinez (UC

532123); McEwen Rd (DGK 04.329); Mount Wanda (AGM 67); Pig Sale (DGK 03.129); Pinole Valley. *Holocarpha macradenia* (DC.) Greene, an annual with larger flower heads (>6 mm) and shorter (<15 cm) stems is not known from the study area. It had several (now extirpated) localities on dense soil in the area immediately south (Pinole UC 1428043). This plant is federally listed as threatened and state-listed as endangered (U.S. Fish and Wildlife Service 2005).

**Hypochaeris glabra* L. Common. Disturbed grasslands. Mare Island; Mount Wanda (JOMU 4329).

**Hypochaeris radicata* L. Common. Disturbed areas. Cummings Skyway (DGK 03.353); Mare Island; Mount Wanda; Muir House.

**Isocoma menziesii* (Hook. & Arn.) G. L. Nesom var. *menziesii*. Rare. Rough lawns. Adventive from southern California. Rodeo Point (DGK 10.446).

Iva axillaris Pursh. Occasional. Compacted soils and along roadsides. Benicia (JEPS 41091); Mare Island (AGM 189); Martinez (UC 1041107); Rodeo Point (DGK 03.084); Selby.

Jaumea carnosa (Less.) A. Gray. Common. Intertidal zone of salt and brackish marshes. Benicia (UC 127981); Mare Island (DGK 05.338); Martinez Marsh (DGK 03.099); Point Pinole; Southampton Marsh (DGK 05.456).

**Lactuca serriola* L. Uncommon. Uplands associated with brackish marshes, but to be looked for in other disturbed areas. Pacheco Marsh (DGK 06.331).

**Lactuca virosa* L. Common. Partly shaded areas. Crockett; Mare Island; Mount Wanda (JOMU 4714); Muir House.

Lagophylla ramosissima Nutt. Uncommon. Grasslands. Franklin Ridge; Mount Wanda; Pinole Peak (AGM 270).

Lasthenia californica DC. ex Lindl. subsp. *californica*. Rare. Seasonally moist grasslands. Franklin Canyon (AGM 229) (with *L. conjugens* from which it is distinguished by its fused [vs. half-fused] phyllaries); Point Pinole.

Lasthenia conjugens Greene. Rare. Seasonally moist grasslands. A federally endangered species (U.S. Fish and Wildlife Service 2005). Franklin Canyon near Luzon (CAS 1035823), growing with *L. californica* subsp. *californica*.

Lasthenia fremontii (Torr. ex A. Gray) Greene. Rare (historic). Vernal pools. Vallejo (ND-G 061304, 1888).

Lasthenia glaberrima DC. Rare (historic). Seasonally wet grasslands. Vallejo (JEPS 35385, 1940).

Lasthenia glabrata Lindl. subsp. *glabrata*. Rare (historic). Benicia (JEPS S35391, 1938); Martinez (UC 62999).

Lasthenia platycarpa (A. Gray) Greene. Rare (historic). Vernal pools. Vallejo (JEPS 9871,

1883); this is the holotype of *Baeria carnosa* Greene.

Layia chrysanthemoides (DC.) A. Gray. Rare (historic). Grazed grasslands. Vallejo (ND-G 061057, 1888); east of Rodeo (AGM 227). *L. hieracioides*, with smaller flower heads (<15 mm) and purple spots on the stem is known along Hampton Rd., just south of the study area (DGK 07.429).

**Leucanthemum vulgare* Lam. Rare. Rough lawns. This Old World annual is pervasive in the eastern U.S. In California, it is most common along the coast. Refugio Valley (AGM 309).

Logfia filaginoides (Hook. & Arn.) Morefield [*Filago californica* Nutt.]. Rare. Chaparral. Ozol Rock (DGK 05.278).

**Logfia gallica* (L.) Coss. & Germ. [*Filago g.* L.]. Common. Grasslands and roadsides. Cañada del Cierbo (DGK 04.185); Mare Island (AGM 97); Ozol Rock (DGK 04.121).

Madia elegans D. Don ex Lindl. Rare. Rocky outcrops. Martinez (DGK s.n.); Mount Wanda (JOMU 4654).

Madia exigua (Sm.) A. Gray. Uncommon. Edges of brush. Often overlooked due to its small size. Edwards Canyon (DGK 04.205); Ozol Rock (DGK 05.257).

Madia gracilis (Sm.) D. D. Keck & J. C. Clausen ex Applegate. Common. Grassy hills. Cañada del Cierbo (DGK 04.184); Crockett, 5th Street Prairie (AGM 76); Franklin Canyon (JEPS 21969, DGK 05.163); Mount Wanda (JOMU 4331).

Madia sativa Molina. Common. Disturbed areas. Mare Island (AGM 108); Pinole Creek (DGK 03.136); Refugio Valley (JEPS 21968).

**Matricaria discoidea* DC. (*Chamomilla suaveolens* [Pursh] Rydb.) Common. Along roads, paths and in other areas of compacted soil. Mount Wanda (JOMU 4319); Muir House; Ozol Rock (DGK 03.045).

Micropus californicus Fisch. & C. A. Mey. var. *californicus*. Rare annual. Rocky areas. Mount Wanda (DGK 04.155); Ozol Rock (DGK 04.125).

Microseris douglasii (DC.) Sch. Bip. subsp. *douglasii*. Occasional. Thin soil in sun. Cañada del Cierbo (DGK 04.189); Franklin Canyon (JEPS 36137); Ozol Rock (DGK 04.123).

Monolopia major DC. Rare. Grasslands. More common inland. Pinole Valley (C. Thayer s.n.).

Pentachaeta alsinoides Greene. Rare (historic). Road cuts and cliffs. Martinez (UC 34652, 1882).

Pluchea odorata (L.) Cass. var. *odorata*. Rare. Tidal brackish marshes in the east. Martinez Marsh (DGK 03.096); Pacheco Marsh (DGK 04.311).

Pseudognaphalium beneolens (Davidson) A. Anderb. (*Gnaphalium canescens* DC. subsp. *b.* [Davidson] Stebbins & D. J. Keil). Uncom-

mon. Steep banks and roadcuts. Ozol Rock (DGK 04.304); Vine Hill (DGK 04.318).

Pseudognaphalium californicum (DC.) A. Anderb. [*Gnaphalium c.* DC.] Common. Steep slopes, roadcuts, and coastal scrub. Although generally viewed as an annual or biennial, some local plants show evidence of persisting for more than two years. Carquinez Scenic Drive (DGK 04.295); Crockett, 5th Street Prairie (DGK 05.382); Ozol Rock (DGK 05.277); Point Pinole (DGK 04.132).

**Pseudognaphalium luteoalbum* (L.) Hilliard & Burtt. [*Gnaphalium luteo-album* L.]. Common. Roadsides and gardens. Crockett; Edwards Canyon; Martinez Train Station (AGM 314); Mount Wanda (DGK 04.223).

Pseudognaphalium ramosissimum (Nutt.) A. Anderb. [*Gnaphalium r.* Nutt.] Rare. Edges of brushy or wooded areas, where it may occur for only one year in the same location. Edwards Canyon (DGK 06.373); Pinole Valley.

Pseudognaphalium stramineum (Kunth) A. Anderb. [*Gnaphalium s.* Kunth]. Occasional. Wetlands and recent burns in sun. Benicia Junction (CAS 218300); Franklin Canyon (JEPS 95763); Giant Marsh; Mare Island (DGK 05.353); Pacheco Marsh (DGK s.n.).

Psilocarphus tenellus Nutt. Uncommon. Edges of coastal scrub. Edwards Canyon (DGK 05.204); Martinez; Mount Wanda (JOMU 4334).

Rafinesquia californica Nutt. Rare. Openings in scrub on steep banks. Edwards Canyon; Ozol Rock (DGK 05.260).

Rigiopappus leptocladus A. Gray. Rare (historic). Benicia (JEPS 34918, 1938). This annual is inconspicuous and easily overlooked by collectors.

Senecio aphanactis Greene. Rare (historic). The type locality of this plant is listed as Mare Island (1874).

Senecio aronicoides DC. Rare. Moist spots under oaks. Edwards Canyon (DGK 04.175).

**Senecio glomeratus* Desf. ex Poiret (*Erechtites glomerata* [Desf. ex Poir.] DC.). Rare. High salt marsh. Giant Marsh (DGK 05.218).

Senecio hydrophilus Nutt. Rare (historic). Tidal brackish marshes. No longer known from the study area. Benicia (CAS 257574); Martinez (UC 35993, 1900).

**Senecio sylvaticus* L. Rare. Cliffs. Ozol Rock (DGK 05.274).

**Senecio vulgaris* L. Pervasive. Disturbed areas and gardens. Crockett; Mare Island (DGK 05.019); Mount Wanda (JOMU 4335); Pinole Valley (DGK 04.037).

**Silybum marianum* (L.) Gaertn. Common. Disturbed areas and soils with high nitrogen. Crockett; Mount Wanda (JOMU 4339); Muir House; Pinole Peak.

Solidago velutina DC. subsp. *californica* (Nutt.) Semple [S. c. Nutt.]. Occasional. Grasslands near scrub or woodland. Franklin Canyon; Mount Wanda (JOMU 4655); Pinole Peak; Selby (AGM 198).

**Soliva sessilis* Ruiz & Pav. Pervasive. Cracks in pavement and compacted soil along roads and paths. Carquinez Scenic Drive; Crockett; Mount Wanda (JOMU 4341).

**Sonchus asper* (L.) Hill subsp. *asper*. Occasional. Disturbed areas. Mare Island (AGM 177); Mount Wanda (JOMU 4343).

**Sonchus oleraceus* L. Common. Disturbed areas. Crockett; Martinez; Mount Wanda (JEPS 100168).

Stephanomeria elata Nutt. Rare. Cliffs. Selby (UC 1606432).

Stephanomeria virgata Benth. subsp. *pleurocarpa* (Greene) Gottlieb. Rare. Vallejo (CAS 208010).

Symphyotrichum chilense (Nees) G. L. Nesom [*Aster chilensis* Nees]. Occasional. Moist areas, but also on grassy hills. Bull Valley (DGK s.n.); Giant Marsh (CAS 490749); Mare Island; Mount Wanda. *S. lentum* (Greene) G. L. Nesom, perhaps best treated as an ecotype of *S. chilense*, differs in being glabrous or subglabrous and having thinner leaves, and should be looked for in brackish marshes.

Symphyotrichum lanceolatum (Willd.) G. L. Nesom var. *hesperium* (A. Gray) G. L. Nesom (*Aster lanceolatus* Willd. subsp. *hesperius* [A. Gray] Semple & Chmiel.). Rare. Grasslands. Plants keying to this taxon have obtuse phyllaries and obovate lvs, but lines of hairs running up the stems. They may be a variant of *S. chilense*. Rodeo Point (DGK 06.507); Selby (AGM 204).

Symphyotrichum subulatum (Michx.) G. L. Nesom var. *parviflorum* (Nees) S.D. Sundb. [*Aster subulatus* Michx. var. *ligulatus* Shinners]. Uncommon. Wet muddy soil on the edge of brackish and freshwater marshes or ditches. In some characters these plants approach *S. s.* var. *squamatum* (Spreng.) S. D. Sundb., a taxon reported as adventive in California. Crockett; Pacheco Marsh (DGK 07.472).

**Taraxacum officinale* G. H. Weber ex F. H. Wigg. Occasional. Irrigated lawns, moist slopes, and gardens. Crockett; Mount Wanda; Point Pinole (DGK 05.058); Vallejo (DGK 05.116).

**Tragopogon porrifolius* L. Occasional. Roadsides. Crockett (DGK 04.074); Mount Wanda (JOMU 4347); Rodeo (DGK 10.447).

Uropappus lindleyi (DC.) Nutt. Rare. Rocky outcrops. Mount Wanda (JOMU 4349); Ozol Rock (DGK 05.258).

Wyethia angustifolia (DC.) Nutt. Common. Undisturbed grasslands. Beaver Ravine (DGK 05.307); Carquinez Scenic Drive

(DGK 04.065); Mare Island (AGM 98); Mount Wanda (JOMU 4351); Selby.

Wyethia glabra A. Gray (including *W. helenioides* [DC.] Nutt.) Occasional. Steep slopes. It is distinguished from *W. angustifolia* by its larger, hairier leaves and its earlier flowering time (March vs. May). Mount Wanda (JOMU 4701); Ozol Rock; Pinole Valley (DGK 04.030); Port Costa (DGK 09.215).

Xanthium spinosum L. Uncommon. Wet areas. Mare Island (AGM 181); Mount Wanda (JOMU 4718).

Xanthium strumarium L. Occasional. Wet ditches and the edges of cow ponds. Mare Island (AGM 164); Mount Wanda (JOMU 4720); Muir House; Point Pinole (DGK 06.504).

Berberidaceae

Berberis pinnata Lag. subsp. *pinnata*. Rare. A single, unusually tall (1.6 m) plant was known from above Bull Valley (East Bay Regional Parks Botanic Garden living collection).

Betulaceae

1. Trees, usually single-trunked; frs borne in cone-like structures	<i>Alnus rhombifolia</i>
1' Shrubs, clumping from below ground; frs borne singly in bladder-like bracts	<i>Corylus cornuta</i> subsp. <i>californica</i>

**Alnus rhombifolia* Nutt. Rare. Along streams. Spontaneous near street plantings. The nearest native examples are along Wildcat Creek about 3 km south of the study area. Martinez (DGK 05.245).

Corylus cornuta Marshall subsp. *californica* (A. DC.) E. Murray. Uncommon. Mesic, shaded slopes. Sky Ranch; Vaca Canyon (AGM 261).

Boraginaceae

1. Calyx lobes alternate calyx appendages (<i>Nemophila</i>)	2
1' Calyx lobes lacking appendages	4
2. Corollas purple-spotted on lobe tips	<i>Nemophila maculata</i>
2' Corollas blue to white, not purple-spotted.	3
3. Corollas >1 cm diam, pale-blue with white centers	<i>Nemophila menziesii</i>
3' Corollas <1 cm diam, white (rarely bluish)	<i>Nemophila heterophylla</i>
4. Lvs 20–40 cm, long-petioled, mostly basal; corollas blue turning purple-pink.	<i>Cynoglossum grande</i>
4' Lvs 1–15 cm; corollas white, purple, or yellow	5
5. Lvs fleshy, glabrous (often glaucous and bluish); mostly in saline soils	<i>Heliotropium curassavicum</i> var. <i>oculatum</i>
5' Lvs herbaceous, hairy to glabrous; mostly not in saline soils	6
6. Inflorescences open to slightly coiled, not tightly coiled when mature	7
6' Inflorescences tightly coiled when mature	11
7. Corollas campanulate; pls glandular, aromatic	<i>Eucrypta chrysanthemifolia</i> var. <i>chrysanthemifolia</i>

7' Corollas salverform; pls neither glandular nor aromatic (*Plagiobothrys*) 8
 8. Lvs mostly basal, cauline lvs reduced and alternate; upland pls *Plagiobothrys nothofulvus*
 8' Lvs mostly cauline; vernally wet areas. 9
 9. Fr attachment scars basal *Plagiobothrys stipitatus* var. *micranthus*
 9' Fr attachment scars lateral. 10
 10. Infls with bracts throughout *Plagiobothrys trachycarpus*
 10' Infls with bracts in proximal half *Plagiobothrys bracteatus*
 11. Corollas orange to yellow, rarely white; open grasslands (*Amsinckia*). 12
 11' Corollas blue, purple, or creamy white; rocky slopes or scrub (*Phacelia*). 13
 12. Corollas 4–10 mm diam; orange with red spots *Amsinckia intermedia*
 12' Corollas 2–3 mm diam; yellow-orange w/o spots *Amsinckia menziesii*
 13. Perennials; lvs simple to 1-pinnate 14
 13' Annuals; lvs 2-pinnate 16
 14. Corollas purple *Phacelia californica*
 14' Corollas white 15
 15. Pls tightly tufted; end lflets narrowly ovate *Phacelia imbricata* subsp. *imbricata*.
 15' Pls loosely tufted; end lflets broadly ovate *Phacelia nemoralis* subsp. *nemoralis*
 16. Pedicels to 3 mm; corollas cream-white (to purple), deciduous *Phacelia distans*
 16' Pedicels <3 mm; corollas purple, persistent *Phacelia tanacetifolia*

Amsinckia intermedia Fisch. & C. A. Mey. Common. Grassland. It is not as common in weedy, disturbed sites as it is in more inland localities. Hercules (UC 1094057); Mount Wanda (JOMU 4355); Sky Ranch (DGK 04.011); Vallejo (ND-G 042876).

Amsinckia menziesii (Lehm.) A. Nelson & J. F. Macbr. Occasional. Grasslands. Franklin Canyon (DGK 05.039); Mare Island (DGK 05.020).

Cynoglossum grande Douglas ex Lehm. Occasional. Shaded slopes under oaks and bays. Mount Wanda (JOMU 4433); Sky Ranch; Vaca Canyon (DGK 05.010).

Eucrypta chrysanthemifolia (Benth.) Greene var. *chrysanthemifolia*. Uncommon. Rocky slopes. Crockett (JEPS 1724); Martinez (UC 35514); Ozol Rock (DGK 05.273); Vallejo (ND-G 041711).

Heliotropium curassavicum L. var. *oculatum* (A. Heller) Tidestr. Rare. Saline soils adjacent to marshes. Martinez Marsh (AGM 327); Muir Grave (DGK 04.307); Rodeo Shore (DGK 06.361).

Nemophila heterophylla Fisch. & C. A. Mey. Common. Shady banks. Crockett (DGK 05.182); Martinez; Mount Wanda (JOMU 4674); Port Costa (UC 67127, 1901); Sky Ranch (AGM 210); Vaca Canyon (AGM 258).

**Nemophila maculata* Benth. ex Lindl. Rare. Shady banks. Mount Wanda (JOMU 4462);

a waif, probably introduced from wildflower seed mix.

Nemophila menziesii Hook. & Arn. var. *menziesii*. Rare. Grasslands on north-facing slopes. Pinole Peak (DGK 05.084).

Phacelia californica Cham. Rare. Rocky slopes in the west. Locally, corollas are purple and the plant is hispid and less densely imbricate than *P. imbricata* subsp. *i.* Selby. Edward's Canyon (DGK 05.189).

Phacelia distans Benth. Occasional. Rocky cliffs. Corollas are dirty-white. Cañada del Cierbo (DGK 04.095); Cummings Skyway (DGK 03.359); Kite Hill (DGK 05.327); Rodeo Creek (DGK 05.141).

Phacelia imbricata Greene subsp. *imbricata*. Rare. Corollas are white. Benicia (JEPS 2160); Pinole Peak (AGM 275).

Phacelia nemoralis Greene subsp. *nemoralis*. Uncommon. Brushy areas. Although hispid like *P. californica*, this species has dirty-white corollas and a strictly erect habit. Edwards Canyon (DGK 05.189); Ozol Rock.

Phacelia tanacetifolia Benth. Rare. Corollas purple. South-facing slope northwest of I-80 and Cummings Skyway (DGK 04.056).

Plagiobothrys bracteatus (Howell) I. M. Johnst. Uncommon. Puddles and seasonal wetlands. Encountered along dirt roads in spring. Fernandez Ranch (DGK 05.093); Luzon (DGK 05.076); Rodeo Creek (DGK 05.136).

Plagiobothrys nothofulvus (A. Gray) A. Gray. Rare. Grassy hilltops. Franklin Canyon (DGK 05.172); Pinole Peak (DGK 05.086).

Plagiobothrys stipitatus (Greene) I. M. Johnst. var. *micranthus* (Piper) I. M. Johnston. Rare (historic). Vallejo (UC 78123, 1874).

Plagiobothrys trachycarpus (A. Gray) I. M. Johnst. Rare. Vernal pools. Luzon (AGM 230).

Brassicaceae

1. Frs >4 × longer than wide 2
 1' Frs <4 × longer than wide 18
 2. Frs indehiscent, constricted between seeds (*Raphanus*) 3
 2' Frs dehiscent, not conspicuously constricted between seeds 4
 3. Fr constrictions about 1/2 widest width of fr; frs 2–12-seeded *Raphanus raphanistrum*
 3' Fr constrictions about 3/4 widest width of fr; frs 1–3(5)-seeded *Raphanus sativus*
 4. Corollas white 5
 4' Corollas yellow (rarely orange) 9
 5. Lflets >2 × longer than wide; frs descending *Caulanthus lasiophyllus*
 5' Lflets <2 × longer than wide; frs ascending (*Cardamine*) 6
 6. Basal lvs ternate or simple, cauline lvs w/ 2–5 lflets *Cardamine californica*
 6' Basal lvs pinnate, cauline lvs w/ 4–12 lflets 7
 7. Frs <1 mm diam *Cardamine hirsuta*
 7' Frs 1–2 mm diam 8
 8. Lflets sessile *Cardamine oligosperma*
 8' Lflets petiolulate *Cardamine flexuosa*

9. Racemes w/ leafy bracts. . . *Tropidocarpum gracile*
 9' Raceme bracts reduced or absent 10
 10. Cauline lvs compound 11
 10' Cauline lvs simple (sometimes deeply lobed). . . 12
 11. Frs elliptic, <5× longer than wide.
 *Nasturtium officinale*
 11' Frs linear, >5× longer than wide
 *Barbarea vulgaris*
 12. Lf margins entire *Erysimum cheiri*
 12' Lf margins toothed, lobed, or compound . . 13
 13. Fr beaks obscure (*Sisymbrium*) 14
 13' Fr beaks prominent. 15
 14. Frs narrowly awl-shaped, ascending
 *Sisymbrium officinale*
 14' Frs linear, spreading *Sisymbrium orientale*
 15. Fr valves 1-veined (*Brassica*) 16
 15' Fr valves 3–7-veined 17
 16. Cauline lvs clasping. *Brassica rapa*
 16' Cauline lvs w/ tapered bases *Brassica nigra*
 17. Frs appressed to stem *Hirschfeldia incana*
 17' Frs ascending to spreading. *Sinapis arvensis*
 18. Frs indehiscent 19
 18' Frs splitting in two 20
 19. Frs w/ 2 short basal wings and wide beak,
 cylindrical. *Cakile maritima*
 19' Frs w/o basal wings and beak, disk-shaped. .
 *Thysanocarpus curvipes*
 20. Frs obcordate *Capsella bursa-pastoris*
 20' Frs ovate, bilobed, or orbiculate. 21
 21. Frs deeply 2-lobed. *Lepidium didymum*
 21' Frs not deeply 2-lobed. 22
 22. Frs round, >2 cm diam; corollas purple
 (or white). *Lunaria annua*
 22' Frs oval, sometimes notched at tip;
 corollas white 23
 23. Frs flattened parallel to septum . . . *Lobularia maritima*
 23' Frs flattened perpendicular to septum
 (*Lepidium*) 24
 24. Frs inflated. 25
 24' Frs compressed. 26
 25. Frs glabrous *Lepidium draba*
 25' Frs hairy *Lepidium appelianum*
 26. Perennials; stigma protruding beyond fr . .
 *Lepidium latifolium*
 26' Annuals; stigma not protruding beyond fr . . 27
 27. Frs notched or w/ short terminal valve wings,
 <1/3 fr length. 28
 27' Frs w/ long terminal valve wings, >1/2 fr
 length *Lepidium latipes*
 28. Frs hairy *Lepidium dictyonum*
 28' Frs glabrous *Lepidium nitidum*

**Barbarea vulgaris* W. T. Aiton. Rare. Lake edges. Lake Herman (DGK 04.259).
 **Brassica nigra* (L.) W. D. J. Koch. Common. Roadsides and fallow fields. Mare Island; Mount Wanda (JOMU 4361); Muir House.
 **Brassica rapa* L. Common. Disturbed areas. Crockett (DGK 08.029); Luzon (AGM 217); Mount Wanda; Muir Grave; Muir House.
 **Cakile maritima* Scop. Rare. Sandy bay shore. Point Pinole; Rodeo Shore (DGK 04.313).
 **Capsella bursa-pastoris* (L.) Medik. Pervasive. Roadsides, dirt paths, and disturbed areas. Mount Wanda (JOMU 4363); Muir House; Pinole Creek (DGK 04.027).

Cardamine californica (Nutt.) Greene. Common. Shade of oaks and bays. Mare Island (DGK 05.018); Pinole Creek (DGK 04.023); Vaca Canyon (DGK 05.009).
 **Cardamine flexuosa* With. Occasional. Shaded slopes. Carquinez Scenic Drive (DGK 03.065).
 **Cardamine hirsuta* L. Common. Moist shade. Edwards Canyon (DGK 07.085); Mount Wanda.
Cardamine oligosperma Nutt. Common. Gardens and moist, shady slopes. Edwards Canyon; Mare Island (DGK 05.030); Mount Wanda (JOMU 4365); Sky Ranch (DGK 04.008).
 **Lepidium didymum* L. (*Coronopus didymus* [L.] Sm.). Rare. Marsh edges. Giant Marsh (DGK 05.210).
 **Erysimum cheiri* L. (Crantz). Rare. Persisting from cultivation. Crockett, Crolona Heights (DGK 04.075).
Caulanthus lasiophyllus (Hook. & Arn.) Payson. Rare (historic). Martinez (UC 10944, 1862).
 **Hirschfeldia incana* (L.) Lagr.-Foss. Pervasive. Disturbed areas. Edwards Canyon; Mount Wanda (JOMU 4371); Muir House.
 **Lepidium appelianum* Al-Shehbaz (*Cardaria pubescens* [C. A. Mey.] Jarm.) Uncommon. Along railroad tracks and in disturbed grasslands. Bull Valley (AGM 86); Pinole (JEPS 25275).
Lepidium dictyonum L. Occasional. Pavement cracks and roadsides. West of Blume Hill (DGK 08.092).
 **Lepidium draba* L. (*Cardaria d.* [L.] Desv.) Occasional. Grasslands. Mare Island (DGK 05.354); Fernandez Ranch (DGK 05.092); Franklin Canyon; Vaca Canyon (DGK 05.103).
 **Lepidium latifolium* L. Pervasive. Along the edges of marshes, especially in saline soils. Luzon (AGM 301); Martinez Marsh; Mount Wanda (JOMU 4659); Point Pinole (JEPS 76804); Rodeo Point (DGK 03.087).
Lepidium latipes Hook. Rare. Saline soils. Luzon; Martinez (UC 10641, 1862).
Lepidium nitidum Nutt. Pervasive. Compacted soil. Franklin Canyon (DGK 03.037); Mount Wanda (JOMU 4367); Ozol Rock (DGK 03.044); Pinole Creek (DGK 04.028).
 **Lobularia maritima* (L.) Desv. Rare. Sandy soil. Luzon (AGM 304).
 **Lunaria annua* L. Rare. Lightly shaded slopes. Bull Valley; Crockett (DGK 04.214).
Nasturtium officinale W. T. Aiton (*Rorippa nasturtium-aquaticum* [L.] Hayek). Common. Running water. Cañada del Cierbo (DGK 04.098); Mount Wanda (JOMU 4421); Muir Grave; Muir House; Vallejo.
 **Raphanus raphanistrum* L. Uncommon. Disturbed soil. Mount Wanda (JOMU 4369); Muir House.
 **Raphanus sativus* L. Common. Roadsides and fields. The two introduced species of *Raphanus*

often hybridize (Ridley et al. 2008). Mare Island (DGK 05.349); Mount Wanda; Muir House (DGK 08.030); Vallejo.

**Sinapis arvensis* L. Common. Disturbed areas. Edwards Canyon (DGK 08.028); Franklin Canyon (AGM 207); Mount Wanda (JOMU 4639).

**Sisymbrium officinale* (L.) Scop. Uncommon. Disturbed areas. Mount Wanda (JOMU 4373); Ozol Rock, but to be expected elsewhere.

**Sisymbrium orientale* L. Rare. Disturbed slopes in shade. Crockett (DGK 08.027), but to be expected elsewhere.

**Thysanocarpus curvipes* Hook. Uncommon. Rocky outcrops. Fernandez Ranch (DGK 05.090); Mount Wanda (AGM 69); Ozol Rock (DGK 03.077).

Tropidocarpum gracile Hook. Rare (historic). Grasslands. Martinez (UC 14397, 1889).

Campanulaceae

1. Corollas zygomorphic, showy; vernal pools *Downingia pulchella*
- 1' Corollas actinomorphic, inconspicuous; uplands *Triodanis biflora*

Downingia pulchella (Lindl.) Torr. Rare (historic). Vernal pools. This species is no longer extant in the study area. Martinez (JEPS 14473); Vallejo (JEPS 14430, 1940).

Triodanis biflora (Ruiz Lopez & Pavon) E. Greene. Rare. South-facing slopes. Pinole Valley (C. Thayer s.n.).

Caprifoliaceae

1. Corollas tubular, $>3\times$ longer than wide; frs red or black (*Lonicera*) 2
- 1' Corollas campanulate to urceolate, $<2\times$ longer than wide; frs white (*Symporicarpos*) . . . 3
 2. Pls vining; paired bracts green, subtending 5–12 fls. *Lonicera hispidula*
 - 2' Pls shrubby; paired bracts flushed red, subtending 2 fls *Lonicera involucrata* var. *ledebourii*
3. Pls >60 cm; branchlets glabrous *Symporicarpos albus* var. *laevigatus*
- 3' Pls <35 cm; branchlets hairy *Symporicarpos mollis*

Lonicera hispidula (Lindl.) Douglas ex Torr. & A. Gray. Occasional. Scrub/woodland interface. The red berries can be quite showy in fall. Edwards Canyon (DGK 04.167); Mount Wanda; Vaca Canyon.

Lonicera involucrata (Richardson) Spreng. var. *ledebourii* (Eschsch.) Jeps. Rare. Wet margins of larger streams flowing west. Pinole Creek.

Symporicarpos albus (L.) S. F. Blake var. *laevigatus* (Fernald) S. F. Blake. Common. Riparian areas and under trees. Edwards Canyon; Mount Wanda (JOMU 4661); Muir House; Pinole Creek (DGK 03.140); Vaca Canyon.

Symporicarpos mollis Nutt. Uncommon. Shady banks. A rhizomatous subshrub forming large

patches of stems only 15 cm high. Bull Valley; Edwards Canyon (DGK 04.162); Kite Hill (DGK 05.309); Pinole Creek (DGK 04.033).

Caryophyllaceae

1. Stipules present, scarious 2
- 1' Stipules none 8
 2. Lvs obovate *Polycarpon tetraphyllum* var. *tetraphyllum*
 - 2' Lvs acicular 3
 3. Lvs whorled *Spergula arvensis*
 - 3' Lvs opposite (*Spergularia*) 4
 4. Seeds not winged; annuals (short-lived perennials) 5
 - 4' Some seeds winged; pls stout perennials . . . 7
 5. Lvs fascicled in axils; stipules long acuminate *Spergularia rubra*
 - 5' Lvs not fascicled in axils; stipules acute. 6
 6. Stamens 8–10; seeds plump. *Spergularia bocconi*
 - 6' Stamens 2–5(6); seeds flattened. *Spergularia marina*
 7. Corollas pink *Spergularia macrotheca* var. *macrotheca*
 - 7' Corollas white *Spergularia villosa*
 8. Calyces tubular; sepals united $>1/2$ length. . 9
 - 8' Calyces not tubular; sepals not or little united 10
 9. Fls emerging from involucre of bracts *Petrorthagia dubia*
 - 9' Fls not emerging from involucre of bracts. *Silene gallica*
 10. Frs opening only on distal end, leaving jagged apex (*Cerastium*). 11
 - 10' Frs splitting from top to bottom. 12
 11. Perennials; pedicels $>$ calyces *Cerastium fontanum* subsp. *vulgare*
 - 11' Annuals; pedicels $<$ calyces *Cerastium glomeratum*
 12. Styles = number of sepals (*Sagina*) 13
 - 12' Styles $<$ number of sepals. 14
 13. Petals absent. *Sagina apetala*
 - 13' Petals present *Sagina decumbens* subsp. *occidentalis*
 14. Petals entire *Minuartia californica*
 - 14' Petals bifid or none (*Stellaria*) 15
 15. Pls glabrous except for line of hairs along stem; petals present *Stellaria media*
 - 15' Pls glabrous or sub-glabrous; petals lacking *Stellaria nitens*

**Cerastium fontanum* Baumg. subsp. *vulgare* (Hartm.) Greuter & Burdet. Uncommon. Lawns. Martinez (DGK 05.248); Point Pinole.

**Cerastium glomeratum* Thuill. Common. Gardens and waste areas. Edwards Canyon (DGK 05.272-D); Ozol Rock (DGK 03.072); Vallejo (DGK 05.115).

Minuartia californica (A. Gray) Mattf. Rare (historic). Martinez (UC 465577, 1889).

**Petrorthagia dubia* (Raf.) G. López & Romo. Rare. South-facing slopes. Pinole Valley (C. Thayer s.n.).

**Polycarpon tetraphyllum* (L.) L. var. *tetraphyllum*. Uncommon. To be looked for along sidewalks and in other disturbed areas. Crockett; Vallejo (UC 120246, 1892).

**Sagina apetala* Ard. Occasional. Edge of coastal scrub. Often overlooked. Edwards Canyon (DGK 05.204b); Fernandez Ranch.

Sagina decumbens (Elliott) Torr. & A. Gray subsp. *occidentalis* (S. Watson) G. E. Crow. Rare (historic). Vallejo (ND-G 016417, 1874).

**Silene gallica* L. Pervasive. Grasslands and rough lawns. Cañada del Cierbo (DGK 04.188); Franklin Canyon (DGK 05.168); Martinez (DGK 05.242); Mount Wanda (DGK 04.153); Point Pinole (DGK 05.057).

**Spergula arvensis* L. Rare. Disturbed areas. Mare Island; Rankin Park (AGM 214).

**Spergularia bocconi* (Scheele) Graebn. Rare. Salt and brackish marshes. Giant Marsh (DGK 05.216).

Spergularia macrotheca (Cham. & Schleidl.) Heynh. var. *macrotheca* Rare. Chalky bluffs. Point Pinole (DGK 05.048).

Spergularia marina (L.) Besser. Common. Edges of salt and brackish marshes. Giant Marsh (DGK 05.215); Mare Island (DGK 05.350); Martinez Marsh (UC 1618131); Pacheco Marsh (AGM 319).

**Spergularia rubra* (L.) J. Presl & C. Presl. Pervasive. Compacted soils, e.g., along paths and in sidewalk cracks. Mare Island (AGM 104); Martinez; Mount Wanda.

**Spergularia villosa* (Pers.) Cambess. Rare. Saline grasslands. Point Pinole (DGK 04.141).

**Stellaria media* (L.) Vill. Pervasive. Grasslands and gardens. Crockett; Mount Wanda (JOMU 4382); Ozol Rock (DGK 03.058); Vallejo.

Stellaria nitens Nutt. Rare (historic). Grasslands. This annual is inconspicuous and easily missed. Martinez (UC13617, 1889).

Chenopodiaceae

1. Lf blades absent, lf bases modified as succulent stem joints 2
- 1' Lf blades present, lf bases unmodified. 3
 2. Pl perennial shrub. *Salicornia pacifica*
 - 2' Pl annual herb *Salicornia depressa*
3. Lvs linear to subulate, fr horizontally winged (*Salsola*) 4
- 3' Lvs narrowly ovate to broad, fr not horizontally winged 6
 4. Most lvs opposite, not spine-tipped. *Salsola soda*
 - 4' Most lvs alternate, usually spine-tipped. 5
5. Pl perennial, 5/5 fr wings well developed. *Salsola australis*
- 5' Pl annual, 3/5 fr wings well-developed. *Salsola tragus*
 6. Fls unisexual, pistillate fls enclosed by 2 bracts fused in fr (*Atriplex*) 7
 - 6' Fls bisexual, fls w/ perianth, w/out 2 bracts fused in fr. 11
7. Pl annual herb, lvs green w/ few scales 8
- 7' Pl perennial, lvs w/ many silvery scales 9
 8. Fr bracts thickened at base, lvs broadly triangular. *Atriplex prostrata*

- 8' Fr bracts not thickened, lvs lanceolate to triangular. *Atriplex patula*
9. Pl perennial herb. 10
- 9' Pl shrub. *Atriplex lentiformis*
10. Fr fat, fleshy, red. *Atriplex semibaccata*
- 10' Fr thin, compressed. *Atriplex californica*
11. Pl hairy, tepals hooked in fr. *Bassia hyssopifolia*
- 11' Pl glabrous or scaly, tepals not hooked. 12
 12. Ovary partly inferior, fr borne separately on spike (*Beta vulgaris*) 13
 - 12' Ovary superior, fr clustered along spike. 14
13. Basal lf petioles > 8 mm. *Beta vulgaris* subsp. *cicla*
- 13' Basal lf petioles < 5 mm.
 - *Beta vulgaris* subsp. *maritima*
 14. Lvs lobed, pl pungently scented. *Dysphania multifida*
 - 14' Lvs toothed, pl not pungently scented (*Chenopodium*). 15
15. Pl Perennial, wl several stems from caudex. *Chenopodium californicum*
- 15' Pl annual, usually 1 stem from base. 16
16. Lvs triangular. *Chenopodium murale*
- 16' Lvs ovate to rhombic. 17
17. Lvs toothed, pl w/out strong smell. *Chenopodium album*
- 17' Lvs not toothed, pls w/ rotten fish odor. *Chenopodium vulvaria*

Atriplex californica Moq. Rare. Bluffs above the bay in the west. Mare Island (ND-G 015245, 1874); Rodeo Shore.

**Atriplex lentiformis* (Torr.) S. Watson. Rare. Filled wetlands adjacent to Pacheco Marsh, where it may have been planted (AGM 320).

Atriplex patula L. Rare. Mare Island (ND-G 015281, 1874).

**Atriplex prostrata* Boucher ex DC. [*A. triangularis* Willd.]. Common. Salt and brackish marshes. Cañada del Cierbo (DGK 04.194); Martinez Marsh (DGK 03.095); Pacheco Marsh; Vallejo (UC 217171).

**Atriplex semibaccata* R. Br. Occasional. Bluffs and compacted soils adjacent to the bay; to be expected on levees adjacent to saline marshes. Rodeo Point (DGK 04.300); Pacheco Marsh (DGK 06.477).

**Bassia hyssopifolia* (Pall.) Kuntze. Rare. To be expected in diked salt marshes elsewhere. Martinez Marsh (DGK 03.094).

**Beta vulgaris* L. subsp. *maritima* (L.) Arcang. Uncommon. High salt and brackish marshes. Occasionally a weed in fallow agricultural fields. Crockett; Martinez Marsh (DGK 03.097).

**Beta vulgaris* L. subsp. *cicla* (L.) Koch. Rare. Giant Marsh (DGK 05.209).

**Chenopodium album* L. Occasional. Cultivated areas. Crockett; Lake Herman (DGK 04.254).

Chenopodium californicum (S. Watson) S. Watson. Rare. Stable in Franklin Canyon (DGK 04.010).

**Chenopodium murale* L. Common. Disturbed areas. Crockett (DGK 05.046); Vaca Canyon (DGK 04.308).

**Chenopodium vulvaria* L. Rare. Ruderal. Crockett (DGK 05.459).

**Dysphania multifida* (L.) Mosyakin & Clemants [*Chenopodium multifidum* L.]. Occasional. Disturbed areas, especially near wetlands and where grazing occurs. Edwards Canyon; Mare Island (AGM 113); Southampton Marsh (DGK 05.453).

Salicornia depressa Standl. [*S. europaea* L. misapplied; Rare. (historic). Martinez (ND-G 015418, 1892).

Salicornia pacifica Standl. (*Salicornia virginica* L. misapplied; *Sarcocornia pacifica* [Standl.] A. J. Scott). Common. Salt and brackish marshes. Benicia (JEPS 68934); Mare Island (AGM 188); Martinez Marsh (DGK 03.098); Pacheco Marsh; Southampton Marsh.

**Salsola australis* R. Br. Rare. Bay bluffs. Very similar to *S. tragus*, and often confused with it. This species is perennial (vs. annual) and, unlike *S. tragus*, does not break off at the base to form tumbleweeds for fruit dispersal. Rodeo Point (AGM 202).

**Salsola soda* L. Rare. Where salt water ponds in winter. Mare Island (AGM 171); Point Pinole (DGK 04.136).

**Salsola tragus* L. Rare. Vallejo. To be looked for in the east as well.

Cistaceae

Helianthemum scoparium Nutt. Rare. Chaparral and occasionally on rock outcrops. A fire-following species. Glen Cove (CAS 560166); Mount Wanda (JOMU 4387).

Convolvulaceae

1. Pls parasitic; lvs lacking; stems orange (*Cuscuta*) 2
- 1' Pls not parasitic; lvs present; stems green. 4
 2. Stems > 2 mm in diam; bracts gibbous. *Cuscuta japonica* var. *formosana*
 - 2' Stems ~ 1 mm in diam; bracts not gibbous 3
3. Anthers sessile; pls on upland shrubs. *Cuscuta subinclusa*
- 3' Anthers not sessile; pls on saline-marsh vegetation. *Cuscuta salina*
 4. Lvs < 1 cm, ± sessile; fls < 9 mm *Cressa truxillensis*
 - 4' Lvs > 2 cm, petiolate; fls > 15 mm 5
5. Fls < 5 cm; stigma lobes terete. *Convolvulus arvensis*
- 5' Fls > 7 cm; stigma lobes ± flattened (*Calystegia*). 6
 6. Fl bract pair attached > 1 mm below calyces; bracts acicular to subulate. *Calystegia purpurata* subsp. *purpurata*
 - 6' Fl bract pair attached < 1 mm below calyces and partially concealing them; bracts ovate. 7
7. Pls sprawling < 30 cm, not vining, hairy. *Calystegia subacaulis* subsp. *subacaulis*
- 7' Pls vining > 1 m, gen glabrous *Calystegia sepium* subsp. *limnophila*

Calystegia purpurata (Greene) Brummitt subsp. *purpurata*. Occasional. Growing through

shrubs. Franklin Canyon (AGM 79); Refugio Valley; Vallejo (DGK 05.108).

Calystegia sepium (L.) R. Br. subsp. *limnophila* (Greene) Brummitt. Uncommon. Sprawling over rushes and cattails in brackish marshes. A single plant along Edwards Creek in Crockett (DGK 04.289) is probably planted. Martinez Marsh (DGK 03.117); Pacheco Marsh (AGM 321).

Calystegia subacaulis Hook. & Arn. subsp. *subacaulis*. Occasional. Grasslands. In the east, a longer stemmed form may be varietally distinct (R. K. Brummitt, Kew, personal communication). Benicia; Kite Hill (DGK 05.319); Mare Island; Mount Wanda (JOMU 4389).

**Convolvulus arvensis* L. Common. Roadsides and cultivated areas. Glen Cove (DGK 05.286); Mare Island; Mount Wanda (JOMU 4391); Muir House; Vallejo (DGK 04.266).

Cressa truxillensis Kunth. Rare. Areas adjacent to salt and brackish marshes. Benicia (SJSU 10618); Martinez (UC 23230).

**Cuscuta japonica* Choisy var. *formosana* (Hayata) Yunck. Rare. Parasitic on woody vegetation. This robust plant can cover a medium-sized tree and eventually kill it. Although more than one clone has been imported into the United States, the plant generally is spread vegetatively via humans (and perhaps birds). The Hmong are responsible for most of its spread, as they value it for its medicinal uses. It is a federal- and state-listed noxious weed. Rodeo (CDA 5579).

Cuscuta salina Engelm. Common. Parasite (usually on *Salicornia*) in salt and brackish marshes. Benicia (UC 1745812); Hercules (JEPS 25276); Mare Island (AGM 179); Point Pinole; Rodeo Shore (CAS 1052737).

Cuscuta subinclusa Durand & Hilg. Uncommon. Parasite of shrubs. In the study area, usually parasitic on *Toxicodendron*. Edwards Canyon (DGK 06.374); Franklin Canyon (CAS 254024); Refugio Valley; Vallejo (CAS 32549).

Cornaceae

1. Lvs 3–5 cm. *Cornus glabrata*
- 1' Lvs 5–10 cm. *Cornus sericea* subsp. *sericea*

Cornus glabrata Benth. Rare (historic). Alhambra Valley (CAS 12484, 1887).

Cornus sericea L. subsp. *sericea*. Uncommon. Along streams emptying into San Pablo Bay. Fernandez Ranch; Pinole Creek (DGK 03.132).

Crassulaceae

1. Annuals < 5 cm high; lvs opposite. *Crassula connata*
- 1' Rosette-forming perennials > 5 cm; lvs spirally arranged. *Dudleya farinosa*

Crassula connata (Ruiz & Pav.) A. Berger. Occasional. In sparse vegetation. *C. aquatica* (L.) Schönl., with 1 flower per axil rather than

2, should also be searched for in the study area. Franklin Canyon (AGM 209); Luzon (AGM 218); Mare Island (DGK 05.021); Rodeo Creek (JEPS 25118).

Dudleya farinosa (Lindl.) Britton & Rose. Rare. Cliffs near bay. Mare Island (DGK 05.339); Point Pinole (nearly eradicated).

Cucurbitaceae

1. Corollas yellow; frs not spiny..... *Cucurbita foetidissima*
- 1' Corollas yellow-green to cream; frs spiny (*Marah*) 2
2. Corollas yellow-green; frs ± spheric..... *Marah fabacea*
- 2' Corollas cream; frs ovoid. *Marah oregana*

Cucurbita foetidissima Kunth. Rare. Along railroad tracks. The calabazilla is more commonly found in the Great Valley and southwest U.S. east of Martinez (DGK 08.297).

Marah fabacea (Naudin) Naudin ex Greene. Common. Brushy slopes. Annual shoots with creamy flowers emerge in early spring. Crockett; Edwards Canyon; Mare Island; Martinez; Mount Wanda (JOMU 4393); Ozol Rock (DGK 03.040).

Marah oregana (S. Watson) Howell. Rare. At edges of woodland in light shade. Vaca Canyon (AGM 391).

Dipsacaceae

1. Fl spikes corymbose; infl bracts foliaceous *Scabiosa atropurpurea*
- 1' Fl spikes heads; infl bracts acicular, spiny (*Dipsacus*). *Dipsacus sativus*

**Dipsacus sativus* (L.) Honck. Uncommon. Roadsides. Vallejo (DGK 04.277). Benicia.

**Scabiosa atropurpurea* L. Uncommon. Grasslands. This weed is expanding its range. Crockett; Ozol Rock; Benicia (UC 75481); Selby (AGM 200).

Ericaceae

Arbutus menziesii Pursh. Uncommon. Edges of woodland. Two small colonies are found along Upper Alhambra Creek. Otherwise, three isolated specimens are known from along the bluffs lining the south side of the Carquinez Strait. The madrone probably always was uncommon in the study area, but was more frequent before many trees along the southern strait were cut down for firewood for the railroad. Carquinez Scenic Drive (DGK 04.339); Selby (DGK 04.017); Vaca Canyon. *Arctostaphylos crustacea* Eastw. subsp. *crustacea* (Eastw.) P. V. Wells is found along Bear Creek Road about 2 km south of the study area. It is a shrub (vs. tree) with smooth (vs. verrucose) fruits.

Euphorbiaceae

1. Lvs >25 cm *Ricinus communis*
- 1' Lvs <25 cm. 2
2. Lvs lanate, alternate; pls low, spreading. *Croton setigerus*

- 2' Lvs glabrous or sparsely hairy, opposite or alternate; pls prostrate or erect. 3
3. Sap clear; pls dioecious; frs 2-lobed. *Mercurialis ambigua*
- 3' Sap milky; pls monoecious; frs 3-lobed. 4
4. Lvs opposite; pls prostrate (*Chamaesyce*). 5
- 4' Lower lvs alternate; pls upright (*Euphorbia*). 7
5. Lvs pale-green, usually >8 mm long; involucres glabrous; gland appendages absent. *Chamaesyce ocellata* subsp. *ocellata*
- 5' Lvs dark-green, usually <8 mm long; involucres usually hairy; gland appendages present. 6
6. Gland appendage about the same width as gland; lvs gen spotted. *Chamaesyce maculata*
- 6' Gland appendage narrower than gland; lvs not spotted. *Chamaesyce serpyllifolia* subsp. *serpyllifolia*
7. Perennials; pls >25 cm *Euphorbia oblongata*
- 7' Annuals; pls <25 cm. 8
8. Gland appendages not horned; capsules warty. *Euphorbia spathulata*
- 8' Gland appendages horned; capsules not warty. *Euphorbia peplus*

**Chamaesyce maculata* (L.) Small. Common. Gardens, cultivated fields, pavement cracks. Beaver Ravine (DGK 05.316b); Crockett (DGK 05.391); Mount Wanda.

Chamaesyce ocellata (Durand & Hilg.) Millsp. subsp. *ocellata*. Rare. Nearly bare soil. Glen Cove Pond (DGK 05.282b).

**Chamaesyce serpens* (Kunth) Small. Common weed. Disturbed areas. Crockett (DGK 05.380); Edwards Canyon (DGK 04.221); Luzon (AGM 306b); Martinez (DGK 03.118); McEwen Rd (DGK 04.301); Ozol Rock (DGK 04.3430).

Croton setigerus Hook. (*Eremocarpus* s. [Hook.] Benth.) Common. Roadsides. Luzon (AGM 306a); Martinez (DGK 04.320); Mount Wanda (JOMU 4666).

**Euphorbia oblongata* Griseb. Occasional. Edges of brush and woodlands. This perennial weed is actively spreading in the East Bay. Franklin Canyon (JEPS 18166); Martinez Train Station (DGK 04.224); Mount Wanda (JOMU 4395); Muir Grave.

**Euphorbia peplus* L. Pervasive. Lightly shaded areas and in gardens. Edwards Canyon; Mount Wanda; Muir Grave; Muir House.

Euphorbia spathulata Lam. Rare. Grasslands on clay soil. Benicia (JEPS 51927); Carquinez Scenic Drive (DGK 09.295).

**Mercurialis ambigua* L. f. Rare. Gardens and nurseries. Differs from *M. annua* L. in being monoecious (vs. dioecious) with lanceolate (vs. narrowly lanceolate) leaves. Edwards Canyon (DGK 04.044).

**Ricinus communis* L. Rare. Waste ground. Rodeo Shore (DGK 04.316).

Fabaceae

1. Pls woody; fls actinomorphic, showy portions the stamens 2

1' Pls woody or herbaceous; fls zygomorphic, showy portions the corolla 5

2. Fls in spikes >5 cm diam
..... *Paraserianthes lophantha*

2' Fls in heads or spikes <3 cm diam (*Acacia*) 3

3. All lvs bipinnately compound, glaucous
..... *Acacia dealbata*

3' Adult lvs simple, dark green. 4

4. Cream fls in compound heads; frs curved, barely narrowed between seeds.
..... *Acacia melanoxylon*

4' Yellow fls in spikes; frs straight to curved, notably narrowed between seeds.
..... *Acacia longifolia*

5. Pls woody 6

5' Pls herbaceous or weakly woody (*Acmispon glaber* var. g. woody at base) 9

6. Spiny trees; corollas white.
..... *Robinia pseudoacacia*

6' Spineless shrubs; corollas yellow (brooms). 7

7. Lvs simple, dropping early; frs >5 cm
..... *Spartium junceum*

7' Lvs compound, persisting; branches leafy; frs <5 cm 8

8. Fls <2.5 cm, fragrant; styles abruptly bent at tip
..... *Genista monspessulana*

8' Fls >2.5 cm, not fragrant; styles curving upward from middle
..... *Cytisus striatus*

9. Lvs palmately compound w/ >3 lflets (*Lupinus*). 10

9' Lvs pinnately compound or trifoliate 19

10. Weak shrubs; banner petal backs \pm glabrous. 11

10' Herbs; banner petal backs usually hairy (exc. *L. formosus* var. f.) 12

11. Petioles <3 cm; corollas yellow.
..... *Lupinus arboreus*

11' Petioles >3 cm; corollas purple.
..... *Lupinus albifrons* var. *albifrons*.

12. Perennials; several stems emerging from rootstock 13

12' Annuals; pls branching above ground only 14

13. Pls decumbent; lvs silvery; banner petal backs glabrous; upper keel margins glabrous.
..... *Lupinus formosus* var. *formosus*

13' Pls upright; lvs green; banner backs hairy; upper keel margins ciliate near base.
..... *Lupinus latifolius* var. *latifolius*

14. Cotyledons sessile; fls whorled, often secund; stem hollow at base 15

14' Cotyledons petioled; fls whorled or not, not secund; stem solid 16

15. Calyx hairs short, sparse; corollas gen white.
..... *Lupinus microcarpus* var. *densiflorus*

15' Calyx hairs shaggy; corollas gen blue.
..... *Lupinus microcarpus* var. *microcarpus*

16. Pls often >25 cm; divaricately branched; nearly glabrous; succulent; corollas solid blue-purple.
..... *Lupinus succulentus*

16' Pls usually <25 cm; slender; narrowly branched or unbranched; gen hairy; not succulent; corollas blue and white. 17

17. Banner petals longer than wide.
..... *Lupinus bicolor*

17' Banner petals as wide as long. 18

18. Upper keel margins with tooth.
..... *Lupinus affinis*

18' Upper keel margins w/o teeth
..... *Lupinus nanus*

19. Pls sprawling or vining; tendrils present. 20

19' Pls erect, prostrate, or low-spreading; tendrils absent 29

20. Lflets rolled in bud; style flattened, hairy on side only (*Lathyrus*) 21

20' Lflets folded in bud; style cylindrical, hairy all around tip (*Vicia*). 24

21. Lflets 2; fls 20–30 mm
Lathyrus latifolius

21' Lflets >2 ; fl length 10–20 mm 22

22. Stems ridged; corollas pale pink or cream, fading to rust; infls dense
..... *Lathyrus vestitus* var. *v.*

22' Stems winged; corollas bright pink to pink-purple; infls lax 23

23. Pls puberulent; on grassy or brushy slopes
..... *Lathyrus jepsonii* var. *californicus*

23' Pls glabrous; in brackish marshes.
..... *Lathyrus jepsonii* var. *jepsonii*

24. Fls 1–2 at nodes, sessile 25

24' Fls 3–many per raceme, pedunculate. 26

25. Calyces 7–12 mm; corollas 10–18 mm.
..... *Vicia sativa* subsp. *uigra*

25' Calyces 10–15 mm; corollas 18–30 mm.
..... *Vicia sativa* subsp. *sativa*

26. Fls not secund, 15–25 mm; fl length 2.5– $3.5 \times$ width
..... *Vicia americana* subsp. *americana*

26' Fls secund, <16 mm; fl length 4–6 \times width 27

27. Infls w/ 3–12 fls.; corollas dark red-purple; frs puberulent
..... *Vicia benghalensis*

27' Infls w/ 10–25 fls; corollas white, blue-purple, or lavender; frs glabrous 28

28. Lf hairs sparse and not conspicuous; lower calyx lobes lanceolate, 1–2 mm
..... *Vicia villosa* subsp. *varia*

28' Lf hairs conspicuous; lower calyx lobes filiform, 2–4 mm
..... *Vicia villosa* subsp. *villosa*

29. Fls 1-many in umbel; lf w/ flattened rachis; stipules gland-like (occ basal lflets stipule-like) 30

29' Fls 3-many in head or raceme; rachis terete to ovate; stipules foliaceous 34

30. Lflets 5, lower pair at stem; suffrutescent herbs
..... *Lotus corniculatus*

30' Lflets 3–5, lower pair above stem; low, shrubby perennials or annual herbs. 31

31. Shrubs
..... *Acmispon glaber* var. *glaber*

31' Annuals 32

32. Pls low, spreading; corollas white to pale pink.
..... *Acmispon americanus* var. *americanus*

32' Pls prostrate or decumbent; corollas yellow 33

33. Calyx lobes 2–3 \times tube; frs 3–4 mm diam
..... *Acmispon brachycarpus*

33' Calyx lobes about 1 \times tube; frs 2.3–3 mm diam
..... *Acmispon wrangelianus*

34. Lvs w/ >3 lflets 35

34' Lvs w/ 3 lflets 37

35. Frs spiny, not inflated; pls dark green, gland-dotted
..... *Glycyrrhiza lepidota*

35' Frs smooth, inflated; pls pale green to silvery, not gland-dotted (*Astragalus*) 36

36. Perennials, >35 cm high
..... *Astragalus asymmetricus*

36' Annuals, <25 cm high
..... *Astragalus gambelianus*

37. Lvs gland-dotted, neither toothed nor wavy
..... *Rupertia physodes*

37' Lvs not gland-dotted, toothed, and/or wavy 38

38. Infls lax racemes (*Melilotus*). 39

38' Inflorescences few- many-flowered heads (sometimes elongated into a short, dense spike) 40

39. Corollas white *Melilotus albus*

39' Corollas yellow *Melilotus indicus*

40. Petals deciduous; flowers curved or coiled (*Medicago*) 41

40' Petals persistent after withering; flowers ovate, not curved or coiled (*Trifolium*) 43

41. Perennials; corollas purple *Medicago sativa*

41' Annuals, corollas yellow 42

42. Leaflets w/ dark spot; flowers w/ hooked bristles *Medicago arabica*

42' Leaflets w/o dark spot; flowers spiny *Medicago polymorpha*

43. Leaves pinnately trifoliate; corollas yellow 44

43' Leaves palmately trifoliate; corollas white, pink, or purple 45

44. Corollas striate; inflorescences 8–13 mm diam, w/ >20 flowers *Trifolium campestre*

44' Corollas weakly striate; inflorescences 4–8 mm diam, w/ 5–20 flowers *Trifolium dubium*

45. Infl bracts fused, gen >1 mm; infl bracts not sessile 46

45' Infl bracts 0 or <1 mm; infl bracts occ sessile in lf axils 56

46. Calyces or entire banners inflated in fr; involucral bracts free 47

46' Calyces, banners not inflated in fr; involucral bracts gen fused 51

47. Calyces glabrous, not inflated in fr; erect to decumbent annuals 49

47' Calyces hairy, inflated in fr; prostrate perennials 48

48. Annuals; heads sessile . . . *Trifolium tonentosum*

48' Perennials; heads peduncled *Trifolium fragiferum*

49. Flowers 10–20 mm long *Trifolium fucatum*

49' Flowers 4–9 mm long 50

50. Flowers 3–4 mm long, involucral bracts ± half-fused *Trifolium depauperatum* var. *amplectens*

50' Flowers 2–3 mm long; involucral bracts ± free . . . *Trifolium depauperatum* var. *truncatum*

51. Involucrum flat, wheel-shaped, or bracts free, shorter than fls 53

51' Involucrum bowl- or cup-shaped, often as long as fls 52

52. Involucrum bowl-shaped; calyx lobes > 1/2 tube, bristle-tipped . . . *Trifolium microcephalum*

52' Involucrum cup-shaped; calyx lobes < 1/2 tube, not bristle-tipped . . . *Trifolium microdon*

53. Rhizomatous perennials in wetlands; involucres 20–30 mm diam; summer blooming *Trifolium wormskioldii*

53' Annuals on grassy hills; involucres < 20 mm diam; spring blooming 54

54. Calyx lobes > tube, gen entire below tapered tip *Trifolium variegatum* var. *variegatum*

54' Calyx lobes < or ± = tube, often toothed below tapered tip 55

55. Flowers 5–8 mm; involucrum 2–3 mm, gen cut > 1/2 way to base; infls 5–15 fld . . . *Trifolium oliganthum*

55' Flowers 9–18 mm; involucrum > 3 mm, cut < 1/2 way to base; infls > 15-fld . . . *Trifolium willdenovii*

56. Inflorescences w/ 2–8 fls; most fls sterile (modified into stalk-like, bristle-tipped appendages that form a bur that is delivered underground) *Trifolium subterraneum*

56' Inflorescences w/ 10–40 fls; fls all fertile 57

57. Inflorescences 2.5–9 cm long *Trifolium vesiculosum*

57' Inflorescences < 2.5 cm long 58

58. Pedicels becoming 1–4 mm; fls reflexed 59

58' Pedicels remaining < 1 mm; fls erect, spreading 62

59. Creeping perennials; corollas white *Trifolium repens*

59' Erect or sprawling annuals; corollas pink to purple 60

60. Calyx lobes ciliate *Trifolium ciliolatum*

60' Calyx lobes not ciliate (occ hairy) 61

61. Calyx lobes 0.5 mm diam at base, glabrous, corollas bright pink *Trifolium gracilentum*

61' Calyx lobes 0.2 mm diam at base, w/ scattered hairs; corollas pale pink *Trifolium bifidum* var. *decipiens*

62. Inflorescences sessile in lf axils or immediately above pairs of reduced lvs 63

62' Inflorescences peduncled, not subtended by lvs 64

63. Calyx lobes narrow, not plumose; corollas 6–9 mm *Trifolium glomeratum*

63' Calyx lobes bristle-like, plumose, corollas 11–15 mm *Trifolium hirtum*

64. Banners inflated in fr *Trifolium depauperatum* var. *depauperatum*

64' Banners not inflated in fr 65

65. Corollas ± = or < calyces; corollas purple and white *Trifolium albopurpureum*

65' Corollas > calyces; corollas crimson *Trifolium incarnatum*

**Acacia dealbata* Link. Uncommon. Gullies and slopes. Sparingly naturalized, but largely persisting where planted. Crockett (DGK 05.232); Vallejo (CDA 0003940).

**Acacia longifolia* (Andrews) Willd. Rare. Persisting where planted. Vallejo (DGK 05.109).

**Acacia melanoxylon* R. Br. ex W. T. Aiton. Common. In towns, gardens, and where planted for reforestation. Of all the Australian acacias, this species reproduces most vigorously in the study area. Crockett; Franklin Canyon (DGK 05.178).

Acmispon brachycarpus (Benth.) D. D. Sokoloff. Common. Thin soils and where grass is sparse. Martinez; Mount Wanda; Ozol Rock (DGK 05.253).

Acmispon americanus (Nutt.) Rydb. var. *americanus*. Occasional. Roadcuts and rocky outcrops. Mare Island (AGM 89); Martinez (DGK 04.321); Mount Wanda.

Acmispon glaber (Vogel) Brouillet var. *glaber*. Occasional. Thin soils and edges of chaparral. Mare Island (AGM 92); Martinez (DGK 04.319); Mount Wanda (JOMU 4405); Ozol Rock (DGK 05.276); Selby (DGK 04.054).

Acmispon wrangelianus (Fisch. & C. A. Mey) D. D. Sokoloff. Occasional. Thinly vegetated, well-drained soils on banks and slopes. Crockett, 5th Street Prairie (DGK 04.061); Cummings Skyway (DGK 03.355); Luzon (AGM 222); Mount Wanda (JOMU 4403); Ozol Rock (DGK 03.070); Rodeo Creek (DGK 05.152b).

Astragalus asymmetricus E. Sheld. Rare. Grasslands on thin soil. Eckley (UC 1606355). This

population represents the westernmost occurrence of this species.

Astragalus gambelianus E. Sheldon. Rare. South-facing slopes in grassland. Pinole Valley (DGK 05.107).

**Cytisus striatus* (Hill) Rothm. Rare. Sandstone slopes. In other areas of California, this European species is actively expanding its range. Martinez (DGK 07.202).

**Genista monspessulana* (L.) L. A. S. Johnson. Occasional. Disturbed scrub and along roads. Crockett (DGK 04.077); Mare Island; Mount Wanda (JOMU 4397); Point Pinole. Cultivated hybrids involving *G. monspessulana*, *G. stenopetala*, and *G. canariensis* sometimes produce naturalized seedlings, as at Vallejo (CDA 4083).

Glycyrrhiza lepidota Pursh. Uncommon. Upland areas near the bay/strait. Appears highly persistent once established. Martinez (AGM 84); Southampton Marsh (DGK 05.455).

Lathyrus jepsonii Greene var. *californicus* (S. Watson) Hoover. Uncommon. Grassy hills. Alhambra Valley; Blume Hill (DGK 05.071); Franklin Canyon (DGK 05.223); Ozol Rock (DGK 07.204).

Lathyrus jepsonii Greene var. *jepsonii*. Rare. Clambering over rushes and cattails in brackish marshes. CA Rare Plant Rank 1B. Crockett (JEPS 64867); Martinez (ND-G 027553); Pacheco Marsh (AGM 325).

**Lathyrus latifolius* L. Occasional. Steep hillsides. Crockett (DGK 04.284); Mount Wanda (JOMU 4399); Ozol Rock.

Lathyrus vestitus Nutt. var. *vestitus*. Brushy slopes. Similar to and occasionally growing sympatrically with *L. jepsonii* var. *californicus*. *L. vestitus* has ridged rather than distinctly winged stems. Carquinez Scenic Drive (UCD 35904); Crockett (UC 1300852); Franklin Canyon (DGK 07.205); Mount Wanda (JOMU 4401); Ozol Rock (DGK 03.049).

**Lotus corniculatus* L. Common. Above salt and brackish marshes and along sloughs and streams. Cañada del Cierbo (DGK 04.183); Mare Island; Mount Wanda (JOMU 4667).

Lupinus affinis J. Agardh. Rare (historic). Martinez (UC 15755, 1862).

Lupinus albifrons Benth. ex Lindl. var. *albifrons*. Occasional. Well-drained slopes in the west. Crockett; Cummings Skyway (DGK 03.348); Mare Island; Pinole Peak (DGK 03.348); Point Pinole; Rodeo Creek (DGK 05.142).

Lupinus arboreus Sims. Rare. Brushy slopes. West Crockett represents a connection between coastal populations and two historic collections in the Delta. Tormey Headlands (DGK 04.217).

Lupinus bicolor Lindl. Common. Grasslands. Both small- and medium-flowered forms are present. Franklin Canyon (DGK 05.166);

Mount Wanda (JOMU 4407); Ozol Rock (DGK 04.111); Pinole Creek (DGK 04.029); Pinole Peak (AGM 288); Rodeo Creek (DGK 05.146).

Lupinus formosus Greene var. *formosus*. Occasional. Grasslands. Within the study area, this variable species is quite homogeneous, with low stems, silky hairy leaves, and short racemes of dirty lavender-colored flowers. Benicia; Mare Island (AGM 90); McEwen Road (DGK 04.329b); Mount Wanda (JOMU 4668); Pinole Peak (AGM 287); Vallejo (DGK 04.265).

Lupinus latifolius Lindl. ex J. Agardh var. *latifolius*. Rare. Mesic, shady forests. Vaca Canyon (AGM 256).

Lupinus microcarpus Sims var. *densiflorus* (Benth.) Jeps. Uncommon. On slopes. Bull Valley (AGM 88); Franklin Canyon (DGK 05.173).

Lupinus microcarpus Sims var. *microcarpus*. Occasional. Rocky areas and on roadcuts. Rodeo Point (DGK 03.085); Franklin Canyon (DGK 05.224); Mount Wanda (JOMU 4409); Ozol Rock (DGK 04.110).

Lupinus nanus Douglas ex Benth. Uncommon. Upland areas near the water in the west. Giant Marsh (CAS 538814); Mare Island (DGK 04.086); Vallejo (JEPS 65380).

Lupinus succulentus Douglas ex K. Koch. Occasional. Grasslands and roadcuts. Bull Valley (AGM 87); Mount Wanda (JOMU 4431); Selby.

**Medicago arabica* (L.) Huds. Occasional. Weedy areas. Edwards Canyon (DGK 04.169); Mount Wanda (JOMU 4411).

**Medicago polymorpha* L. Pervasive. Disturbed grasslands. Mount Wanda (JOMU 4413); Muir Grave; Muir House; Pinole.

**Medicago sativa* L. Alfalfa. Rare. Roadsides. Fls lavender. Cummings Skyway (DGK 04.219); Mare Island (AGM 175); Mount Wanda.

**Melilotus albus* Medik. Common. Disturbed areas. Often adjacent to saline marshes. Petals white. Mare Island (AGM 190); Pacheco Marsh (AGM 313).

**Melilotus indicus* (L.) All. Occasional. Disturbed areas. Fls yellow. Edwards Canyon (DGK 07.207); Mount Wanda (JOMU 4415); Muir Grave.

**Paraserianthes lophantha* (Willd.) I. C. Wilson (*Albizia l.* [Willd.] Benth.). Rare. Along water channels. Crockett (DGK 06.509).

**Robinia pseudoacacia* L. Uncommon. Persisting from plantings or spontaneous along streams. Mount Wanda (JOMU 4722); Muir Grave; Vallejo (DGK 05.120).

Rupertia physodes (Douglas ex Hook.) J. W. Grimes. Occasional. In part shade on the edge of woods or under brush. Bull Valley (DGK 04.212); Edwards Canyon; Mount Wanda

(JOMU 4669); Ozol Rock (DGK 04.114); Pinole Peak (AGM 272); Selby (AGM 195).

**Spartium junceum* L. Rare. Brushy areas. Southampton Marsh (DGK 03.144); Vallejo (DGK 04.079).

Trifolium albopurpureum Torr. & A. Gray. Rare (historic). Grassland. Benicia (JEPS 66028, 1938).

Trifolium bifidum A. Gray var. *decipiens* Greene. Common. Grassy slopes. Edwards Canyon (DGK 05.199); Franklin Canyon (DGK 05.226); McEwen Rd (AGM 234); Mount Wanda (DGK 04.154); Ozol Rock (DGK 04.118); Rodeo Creek (DGK 05.149).

**Trifolium campestre* Schreb. Uncommon. Grasslands and disturbed areas. Cañada del Cierbo (DGK 04.177); Franklin Canyon (DGK 05.220).

Trifolium ciliolatum Benth. Uncommon. Grassy slopes. Cummings Skyway (DGK 03.350); Mount Wanda (JOMU 4417); Ozol Rock (DGK 02.002).

Trifolium depauperatum Desv. var. *amplectens* (Torr. & A. Gray) McDermott. Rare (historic). Seasonally wet depressions. Martinez (UC 55886, 1901); Vallejo (UC 80347, 1883).

Trifolium depauperatum Desv. var. *depauperatum*. Rare. Wet depressions and grasslands. Franklin Canyon (DGK 05.229); Luzon (AGM 228); Rodeo Creek (DGK 05.135).

Trifolium depauperatum Desv. var. *truncatum* (Greene) J. S. Martin ex Isely. Rare. Seasonally moist slopes. Franklin Canyon (DGK 05.157); Vallejo (JEPS 65722).

**Trifolium dubium* Sibth. Common. Sparse, grassy areas. Crockett, 5th Street Prairie (DGK 04.061-B); Mount Wanda (JOMU 4381).

**Trifolium fragiferum* L. Common. Vernal wet areas. Sometimes growing along streams. Mare Island (AGM 111); Martinez Marsh (DGK 03.110); McEwen Road (DGK 05.389); Muir House; Pinole Peak (AGM 285).

Trifolium fucatum Lindl. Rare. Moist grasslands. Cummings Skyway; Martinez (UC 16536, 1862); Rodeo Creek (DGK 05.147).

**Trifolium glomeratum* L. Occasional. Disturbed grasslands and in compacted soil along roads. Franklin Canyon (DGK 05.158); Mount Wanda (JOMU 4432).

Trifolium gracilentum Torr. & A. Gray. Occasional. Grasslands. Often found with other native clovers. Edwards Canyon (DGK 05.200); Fernandez Ranch; Franklin Canyon (DGK 05.160); Mount Wanda; Rodeo Creek (DGK 05.151).

**Trifolium hirtum* All. Common. Disturbed soil and weedy verges. Cummings Skyway (DGK 05.148); Fernandez Ranch (DGK 09.268); Kite Hill (DGK 08.032b); Mare Island; Mount Wanda (JOMU 4423).

**Trifolium incarnatum* L. Occasional. Roadsides where it persists from stabilization mixes. Blume Hill (DGK 05.067); Crockett (DGK 05.045); Mount Wanda; Muir House.

Trifolium microcephalum Pursh. Uncommon. Grasslands. Carquinez Scenic Drive; Franklin Canyon (DGK 09.271); Mount Wanda (JOMU 4425); Ozol Rock (DGK 05.262).

Trifolium microdon Hook. & Arn. Occasional. Slopes, sometimes in light shade. Edwards Canyon (DGK 05.198); Franklin Canyon (DGK 05.159); Mount Wanda (JOMU 4427).

Trifolium oliganthum Steud. Uncommon. Grassy slopes. Martinez (UC 165545); Mount Wanda (JOMU 4429); Pinole Peak (DGK 05.089); Rodeo Creek (DGK 05.137); Vaca Canyon (DGK 05.104).

**Trifolium repens* L. Occasional. Lawns and weedy areas near cultivation. Crockett (DGK 04.291); Martinez.

**Trifolium subterraneum* L. Common. Grasslands; especially along fire roads and paths. Edwards Canyon (DGK 04.174); Luzon (AGM 216); Mount Wanda.

**Trifolium tonentosum* L. Uncommon. Seasonally moist areas. Fernandez Ranch (DGK 05.094); Glen Cove Shore (DGK 05.299).

Trifolium variegatum Nutt. var. *variegatum* Common. Grasslands. Blume Hill (DGK 05.066); Fernandez Ranch (DGK 04.087); Franklin Canyon (DGK 05.161); Luzon (DGK 05.075); Mare Island; Point Pinole (DGK 05.049).

**Trifolium vesiculosum* Savi. Rare. Ozol Rock (DGK 05.263).

Trifolium willdenovii Sprengel. Occasional. Rich grasslands. Cummings Skyway; Franklin Canyon (DGK 05.167); Pinole (JEPS 70759); Carquinez Scenic Drive (UCD 35901); Mount Wanda (JOMU 4435).

Trifolium wormskioldii Lehm. Rare (historic). Perennially wet areas. In the Delta, it sometimes occurs in high brackish marsh. Mare Island (ND-G 025543, 1874); Martinez (UC 16828, 1900).

Vicia americana Muhl. ex Willd. subsp. *americana*. Uncommon. Brushy slopes. Blume Hill (DGK 05.070); Carquinez Scenic Drive (UCD 35903); Fernandez Ranch; Mount Wanda; Ozol Rock (DGK 03.062); Port Costa (UCD 38561).

**Vicia benghalensis* L. Pervasive. Disturbed areas and roadsides. Cummings Skyway (DGK 03.354); Luzon (AGM 299); Mare Island (DGK 05.029); Mount Wanda (JOMU 4439).

**Vicia sativa* L. subsp. *nigra* (L.) Ehrh. Pervasive. Disturbed, sunny areas. Blume Hill (DGK 05.068); Franklin Canyon (DGK 05.174); Mare Island (DGK 05.028); Vallejo (JEPS 66214).

**Vicia sativa* L. subsp. *sativa*. Pervasive. Disturbed areas. Crockett (JEPS 96229); Ozol Rock; Mount Wanda (JOMU 4437).

**Vicia villosa* Roth subsp. *varia* (Host) Corb. Pervasive. Grasslands along paths and roads. Crockett (UC 1300882); Point Pinole (DGK 05.060).

Vicia villosa Roth subsp. *villosa*. Common. Grasslands and disturbed areas. Bull Valley; Franklin Canyon (DGK 09.310); Hercules; Tormey Headlands (DGK 07.078).

Fagaceae

- 1. Pls evergreen. 2
- 1' Pls deciduous 3
- 2. Lvs hairy underneath. *Quercus ilex*
- 2' Lvs nearly glabrous underneath w/ tufts of hairs in vein axils *Quercus agrifolia*
- 3. Lvs >9 cm, glossy green; lobes bristle-tipped *Quercus kelloggii*
- 3' Lvs <9 cm; dull green or bluish; lobes not (or barely) bristle-tipped 4
- 4. Lvs bluish at maturity; lobes <1/4 way to midrib *Quercus douglasii*
- 4' Lvs green at maturity; lobes >1/4 way to midrib 5
- 5. Some branches drooping in older specimens; acorn elongated *Quercus lobata*
- 5' Branches always upright; acorn short ovoid *Quercus garryana* var. *garryana*

Quercus agrifolia Née. Pervasive and dominant tree. Woodland and streambanks. Crockett (DGK 04.016); Mare Island (DGK 05.031); Mount Wanda (JOMU 4443); Ozol Rock (DGK 07.083); Pinole Valley (DGK 04.020). *Quercus wislizeni* has been reported from west of Martinez and it occurs as a rare tree in woodland or chaparral to the south of the study area. It differs from *Q. agrifolia* in its flat (vs. cupped) leaves without hair tufts in the leaf-vein axils.

Quercus douglasii Hook. & Arn. Common. Drier slopes that are often south facing. Edwards Canyon; Martinez (DGK 05.270); Mount Wanda (JOMU 4445); Ozol Rock (DGK 04.344).

Quercus garryana Dougl. var. *garryana* Rare. In valleys. Pinole Peak (DGK 10.445); Port Costa (DGK 09.672).

**Quercus ilex* L. Uncommon. Seedlings occur under planted trees. Vallejo (DGK 05.237).

Quercus kelloggii Newb. Uncommon. North-facing slopes on east-west running ridges. Cañada del Cierbo (DGK s.n.); Franklin Canyon (DGK 04.330B); Mount Wanda (JOMU 4441); Sky Ranch.

Quercus lobata Née. Common. Hills and ridgetops. Locally, this tree is only occasionally associated with riparian forests. Carquinez Scenic Drive (DGK 04.328); Fernandez Ranch (DGK 07.628); Mount Wanda (JOMU 4447); Ozol Rock (DGK 07.084); Vine Hill (DGK 04.050).

Frankeniaceae

Frankenia salina (Molina) I. M. Johnst. Common. In salt and brackish marshes. Mare Island (AGM 166); Martinez Marsh; Pacheco

Marsh; Point Pinole (AGM 319); Southampton Marsh.

Gentianaceae

- 1. Corollas yellow, 4-lobed *Cicendia quadrangularis*
- 1' Corollas pink, 5-lobed (*Zeltnera*) 2
- 2. Fls ± sessile *Zeltnera muehlenbergii*
- 2' Fls pedicelled *Zeltnera davyi*

Cicendia quadrangularis (Lam.) Griseb. Rare. Grasslands. As it is small, it is easy to overlook. Nevertheless, it is likely that its present rarity is a result of the dominance of introduced annual grasses. Crockett, 5th Street Prairie (DGK 05.316c); Martinez (UC 22848); Point Pinole (DGK 07.111).

Zeltnera davyi (Jeps.) G. Mans. (*Centaurium d.* [Jeps.] Abrams). Rare. Thin grasslands in the west. Franklin Canyon; Point Pinole (DGK 04.149); Vallejo (ND-G 038922).

Zeltnera muehlenbergii (Griseb.) G. Mans. (*Centaurium m.* [Griseb.] Piper). Uncommon. Sometimes dominating disturbed areas that are wet in winter. Mare Island (AGM 112); McEwen Road (DGK 05.388).

Geraniaceae

- 1. Lvs pinnately organized; stamens 5 per fl (*Erodium*) 2
- 1' Lvs palmately organized; stamens 10 per fl (*Geranium*) 5
- 2. Lvs lobed 3
- 2' Lvs compound 4
- 3. Fr bodies 8–11 mm; fr pits each subtended by 2 deep furrows *Erodium botrys*
- 3' Fr bodies 5–8 mm; fr pits each subtended by 1 shallow furrow *Erodium brachycarpum*
- 4. Lflets toothed *Erodium moschatum*
- 4' Lflets deeply pinnatifid or compound *Erodium cicutarium*
- 5. Lvs compound *Geranium robertianum*
- 5' Lvs lobed to dissected 6
- 6. Perennials w/ thick, creeping caudex *Geranium core-core*
- 6' Annuals w/ thin, gen upright, stems 7
- 7. Sepals acute; pls villous 8
- 7' Sepals awned; pls sparsely hairy 10
- 8. Fr bodies wrinkled, glabrous *Geranium molle*
- 8' Fr bodies smooth, hairy 9
- 9. Lf sinuses cut >40% to leaf bases *Geranium pusillum*
- 9' Lf sinuses cut <30% to leaf bases *Geranium rotundifolium*
- 10. Pedicel hairs non-glandular; corollas soft pink *Geranium carolinianum*
- 10' Pedicel hairs glandular; corollas magenta (to soft pink) *Geranium dissectum*

**Erodium brachycarpum* (Godr.) Thell. Rare. Disturbed areas. Benicia (SJSU 10083), but to be expected elsewhere. Differs from *E. botrys* in its fruits with a single (rather than double) cavity near its apex.

**Erodium botrys* (Cav.) Bertol. Pervasive. In sun where other vegetation is sparse. Crockett, Crolona Heights (DGK 05.104); Fernandez

Ranch (DGK 09.266); Mount Wanda (JOMU 4449); Muir House; Point Pinole (DGK 04.148); Vallejo (DGK 09.217).

**Erodium cicutarium* (L.) L'Hér. ex Aiton. Pervasive. Sunny grasslands. Mare Island; Mount Wanda (JOMU 4451); Muir House; Ozol Rock (DGK 03.067).

**Erodium moschatum* (L.) L'Hér. ex Aiton. Common. Gardens, forest edges, and in lightly shaded, disturbed areas. Mount Wanda (JOMU 4453); Muir Grave; Muir House.

Geranium carolinianum L. Rare (historic). Grasslands. Martinez (UC 17121, 1862).

**Geranium core-core* Steud. Rare. Grasslands and along paths. Point Pinole (DGK 08.001).

**Geranium dissectum* L. Pervasive. Grasslands. Mare Island (DGK 04.082); McEwen Road (UC 1301211); Mount Wanda (JEPS 100093); Ozol Rock (DGK 03.075); Pinole Creek (DGK 04.025); Rodeo Point (DGK 03.089); Vine Hill (DGK 04.049).

**Geranium molle* L. Pervasive. Grasslands. Edwards Canyon (DGK 04.203); Mount Wanda (JOMU 4457); Muir House; Ozol Rock (DGK 03.068).

**Geranium pusillum* L. Rare. Disturbed areas in light shade. Glen Cove Shore (DGK 05.283).

**Geranium robertianum* L. Rare. Shady areas. Ozol Rock (DGK 05.254); Point Pinole.

**Geranium rotundifolium* L. Rare. Disturbed areas. Crockett (DGK 09.351).

Grossulariaceae

1. Lvs 25–50 mm; stems not spiny *Ribes sanguineum* var. *glutinosum*
- 1' Lvs 15–25 mm; stems spiny 2
 2. Perianths green and white; lf undersurfaces non-glandular *Ribes californicum* var. *californicum*
 - 2' Perianths white and red; lf undersurfaces glandular *Ribes menziesii* var. *menziesii*

Ribes californicum Hook. & Arn. var. *californicum*. Common. Northern coastal scrub. Edwards Canyon (DGK 03.036); Mount Wanda (JOMU 4459); Sky Ranch (DGK 04.012). *Ribes divaricatum* Dougl. var. *pubiflorum* Koehne, with two- to five-flowered inflorescences (vs. single-flowered) and non-spiny berries (vs. spiny) occurs in shady canyons immediately south of the Carquinez Region.

Ribes menziesii Pursh var. *menziesii*. Rare. Shady, mesic banks. Fernandez Ranch (DGK 05.080); Vaca Canyon (DGK 05.008).

Ribes sanguineum Pursh var. *glutinosum* (Benth.) Loudon. Rare. On railroad banks. A single plant at Selby (DGK 04.285), but the plant occurs more commonly in Wildcat Canyon, about 3.5 km south of the study area.

Haloragaceae

**Myriophyllum spicatum* L. Rare. Lakes and ponds. To be looked for in other bodies of water. Lake Herman (DGK 04.256).

Hypericaceae

**Hypericum calycinum* L. Rare. Persisting from horticultural plantings. Mount Wanda (JOMU 4677).

Juglandaceae

1. Lvs wl 7–11 ovate lflets; bark dark, furrowed *Juglans hindsii*
- 1' Lvs wl 5–7 obovate lflets; bark gray, not furrowed *Juglans regia*

Juglans hindsii R. E. Sm. Occasional. Along streams or on north-facing slopes. Bull Valley (DGK 04.072); Mount Wanda (JOMU 4469); Muir Grave; Muir House; Pinole Creek (DGK 03.135).

**Juglans regia* L. Rare. Persisting from plantings, and rarely spontaneous from seed. Crockett; Mount Wanda (JOMU 4471).

Lamiaceae

1. Pls prostrate *Clinopodium douglasii*
- 1' Pls erect 2
 2. Fertile stamens 2 3
 - 2' Fertile stamens 4 6
 3. Corollas 4-lobed, not 2-lipped; wetlands *Lycopus asper*
 - 3' Corollas 2-lipped; uplands 4
 4. Annual herbs; infls terminal heads *Pogogyne serpylloides*
 - 4' Shrubs; infls axillary glomerules (*Salvia*) 5
 5. Lvs dark green *Salvia mellifera*
 - 5' Lvs pale green, almost white *Salvia leucophylla*
 6. Corollas ± regular 7
 - 6' Corollas 2-lipped 10
 7. Infls single, head-like, terminal *Monardella villosa* subsp. *v.*
 - 7' Infls axillary, not head-like (*Mentha*) 8
 8. Infl whorls clearly spaced (whorls subtended by reflexed lvs) *Mentha pulegium*
 - 8' Infl whorls lacking spaces 9
 9. Lvs petiolate *Mentha × piperita*
 - 9' Lvs sessile *Mentha spicata*
 10. Calyces distinctly 2-lipped 11
 - 10' Calyces not 2-lipped 12
 11. Pls <25 cm tall; calyces not lobed; corollas blue to purple *Scutellaria tuberosa*
 - 11' Pls >25 cm tall; calyces 5-lobed; corollas white *Melissa officinalis*
 12. Calyces 10-lobed *Marrubium vulgare*
 - 12' Calyces 5-lobed 13
 13. Annuals; corollas maroon to deep pink, upper lips hood-like; infls axillary and terminal; infl bracts deeply crenate *Lamium amplexicaule*
 - 13' Perennials; corollas white to pink, upper lips erect-straight, infls terminal; infl bracts entire 14
 14. Infl whorls crowded, not clearly spaced; streamsides and freshwater wetlands *Stachys pycnantha*
 - 14' Infl whorls clearly spaced 15
 15. Lvs and stems thickly covered with soft, woolly hairs; brackish marshes and swampy areas *Stachys albens*
 - 15' Lvs and stems soft hairy; shaded hillsides *Stachys rigida* var. *queretorum*

Clinopodium douglasii (Benth.) Kuntze (*Satureja d.* [Benth.] Briq.). Occasional. Woodland and under brush in moister areas. Edwards Canyon (DGK 05.184); Mount Wanda; Pinole Creek (DGK 05.003).

**Lauvium amplexicaule* L. Rare. Disturbed areas in light shade. Mount Wanda (DGK 05.034); Muir House; Pinole Creek (UC 579839, 1901).

Lycopus asper Greene. Rare (historic). To be looked for in brackish marshes. Benicia (JEPS 63271b, 1891).

**Marrubium vulgare* L. Rare. Disturbed areas near bay. Mare Island (AGM 191).

**Melissa officinalis* L. Uncommon. Creek channels. Edwards Canyon; Elkhorn Creek (DGK 04.293); Muir Grave; Vaca Canyon (DGK 05.462).

**Mentha × piperita*. Uncommon. Creek channels. Cañada del Cierbo (DGK 04.193).

**Mentha pulegium* L. Common. Creek channels and pond edges. Glen Cove Pond (DGK 05.284); Lake Herman (DGK 04.247).

**Mentha spicata* L. Occasional. Creek channels. Some specimens seem to represent hybrids. Considering the tendency of mints to interbreed, it is not surprising that putative hybrids are common. Muir Grave; Muir House; Vaca Canyon (DGK 04.159); Vallejo (DGK 04.272).

Monardella villosa Benth. subsp. *villosa*. Common. Steep banks and cliffs. *M. v.* subsp. *globosa* (Greene) Jokerst was reported from Martinez and Port Costa in the early 20th century; those reports represent *M. v.* subsp. *villosa* as still common in those areas. Mare Island (AGM 110); Martinez (UC 104641); Mount Wanda (JOMU 4476); Pinole Peak (AGM 291); Port Costa (UC 204205).

Pogogyne serpylloides (Torr.) A. Gray. Uncommon. Edges of northern coastal scrub. The minty fragrance is often detected before the plants are seen. Alhambra Valley (CAS 49192, 1887); Edwards Canyon (DGK 05.196); Fernandez Ranch (DGK 05.078); Ozol Rock (DGK 05.267).

**Salvia leucophylla* Greene. Rare. Brushy slopes. Purple sage only occurs spontaneously as far north as San Luis Obispo County. Cummings Skyway at Crockett Boulevard (DGK 05.186). Old plants persisting from plantings.

Salvia mellifera Greene. Rare. Chaparral. The few shrubs on Mount Wanda (JOMU 4479) represent the northernmost known native occurrence of this species. Plants along Cummings Skyway (DGK 04.055) in the west represent waifs from seeds in a slope-stabilization mix.

Scutellaria tuberosa Benth. Rare. Understory of chaparral. Mount Wanda (JOMU 4483); Ozol Rock.

Stachys albens A. Gray. Uncommon. Brackish marshes. Martinez (ND-G 043878, 1892); Pacheco Marsh (AGM 322).

Stachys pycnantha Benth. Rare. Freshwater marshes. Lake Herman (DGK 04.236); McEwen Road; Refugio Valley (AGM 278).

Stachys rigida Nutt. ex Benth. var. *quercketorum* (A. Heller) G. A. Mulligan & D. B. Munro (*S. ajugoides* Benth. var. *r.* [Benth.] Jeps. & Hoover). Common. Dry shade under oaks and bays. Crockett (UC 416579); Crockett, 5th Street Prairie (DGK 04.057); Cummings Skyway (DGK 03.364); Kite Hill (DGK 05.311); Mare Island (DGK 04.090); Martinez (UC 70569, 1889); Mount Wanda (JOMU 4485); Vallejo (UC 733715).

Lauraceae

Unibellularia californica (Hook. & Arn.) Nutt. Pervasive. Drainages and on north-facing slopes. In winter, not only do the leaves of the California bay release their fragrant oils after rains, but the flowers exude an elusive but sweet fragrance. Because a tree in full bloom can have thousands of flowers, this fragrance can sometimes be detected 15 or more meters from the tree. Carquinez Scenic Drive; Franklin Canyon (DGK 03.037B); Mount Wanda (JOMU 4487); Ozol Rock (DGK 03.039); Sky Ranch (DGK 04.013).

Linaceae

1. Corollas white	<i>Hesperolinon californicum</i>
1' Corollas blue	2
2. Stigmas spheric	<i>Linum lewisii</i>
2' Stigmas elongate	<i>Linum bienne</i>

Hesperolinon californicum (Benth.) Small. Rare (historic). Mare Island is the type locality for *Linum californicum* Bentham forma *confertum* A. Gray ex Trelease Greene s.n. (1874). This is a possible mistake; *Hesperolinon californicum* occurs on Sulfur Springs Ridge ~2 km northeast of Mare Island.

**Linum bienne* Mill. Rare. Disturbed grasslands in the west. Edwards Canyon (DGK 06.148B); Mare Island (DGK 04.092); Refugio Valley (AGM 310).

Linum lewisii Pursh. var. *lewisii*. Rare (historic). Probably no longer extant in the study area. Martinez (UC 198752, 1889).

Loasaceae

Mentzelia lindleyi Torr. & A. Gray. Rare (historic). Two collections of this species represent the northernmost populations for this species. This species is much more common in the Central Coast Ranges. Benicia (SD 30227, 1943); Eckley (UC 1481551, 1980).

Lythraceae

1. Pls <20 cm high; corollas <5 mm	<i>Lythrum hyssopifolia</i>
1' Pls >35 cm high; corollas >5 mm	2

2. Infl bracts ovate; pls pubescent
 *Lythrum salicaria*
 2' Infl bracts linear; pls glabrous
 *Lythrum californicum*

Lythrum californicum Torr. & A. Gray. Rare. Brackish marshes or lakeshores. Lake Herman (DGK 04.239); Pacheco Marsh (DGK 03.375B); Southampton Marsh (DGK 03.148).

**Lythrum hyssopifolia* L. Common. Drying mud in areas that pond in winter. Lake Herman (DGK 04.260); Martinez (DGK 04.225); McEwen Road (DGK 04.302); Mount Wanda (JOMU 4682); Point Pinole (DGK 05.213); Rodeo Point (DGK 03.090).

**Lythrum salicaria* L. Rare. Brackish marshes. It is under active control by the State of California as a noxious weed. Pacheco Marsh (DGK 03.375b).

Malvaceae

1. Pls canescent; corollas pale yellow . . . *Malvella leprosa*
 1' Pls subglabrous or pubescent, not canescent;
 corollas white to pink 2
 2. Cauline lvs deeply lobed (>½ way to
 base), often reduced.
 *Sidalcea malviflora* ssp. *laciniata*
 2' Cauline lvs not deeply lobed, not reduced . 3
 3. Bractlets under fl fused 4
 3' Bractlets under fl free 5
 4. Fls <20 cm; stems <12 mm in diam . . .
 *Malva pseudolavatera*
 4' Fls >25 mm; stems >20 mm in diam . . .
 *Malva arborea*
 5. Fr bodies ± smooth on back, margins rounded
 *Malva neglecta*
 5' Fr bodies wrinkled on back, margins ridged . 6
 6. Calyces somewhat enlarged in fr; petal
 claws hairy *Malva nicaeensis*
 6' Calyces distinctly enlarged in fr; petal
 claws glabrous *Malva parviflora*

**Malva arborea* (L.) Webb & Berthel [*Lavatera a.* L.]. Rare. Along wet channels. This species is native to the Mediterranean, but was introduced and quickly escaped from horticulture in the Bay Area in the mid-19th century. Under the Carquinez Bridge in Crockett (DGK 06508).

**Malva neglecta* Wallr. Uncommon. Disturbed areas. Crockett.

**Malva nicaeensis* All. Occasional. Gardens and disturbed areas. Blume Hill (DGK 05.065); Edwards Canyon (DGK 04.220).

**Malva parviflora* L. Uncommon. Disturbed areas. Crockett (DGK 05.047); Martinez.

**Malva pseudolavatera* Webb & Berth. [*Lavatera cretica* L.] Common. Roadsides and waste areas. Cummings Skyway (DGK 03.371); Martinez; Mount Wanda (JOMU 4684); Rodeo Shore (DGK 03.083).

Malvella leprosa (Ortega) Krapov. Occasional. Salt and brackish marshes and other areas with alkaline soil. Luzon; Martinez (AGM 315); Rodeo Point (UC 1606434); Southampton Marsh; Vaca Canyon (DGK 04.306).

Sidalcea malviflora (DC.) Gray ex Benth. ssp. *laciniata* C. L. Hitchc. Rare. Bunchgrass prairies. Benicia (SD 30228, 1943); Cummings Skyway.

Martyniaceae

**Proboscidea lutea* (Lindl.) Stapf. Rare. Cultivated fields. Alhambra Valley Road (DGK 06.359).

Montiaceae

1. Floral bracts opposite, fused; petals white
 (*Claytonia*) 2
 1' Floral bracts alternate, free; petals bright pink
 *Calandrinia ciliata*
 2. Basal lf blades linear to elliptic.
 *Claytonia parviflora* subsp. *parviflora*
 2' Basal lf blades broadly lanceolate to
 deltate. *Claytonia perfoliata* subsp. *perfoliata*

Calandrinia ciliata (Ruiz & Pav.) DC. Uncommon. Thin grasses and along fire roads. Cummings Skyway (DGK 03.369); Mount Wanda (JOMU 4567); Ozol Rock (DGK 03.071); Rankin Park (DGK 04.005); Rodeo Creek.

Claytonia parviflora Douglas ex Hook. subsp. *parviflora*. Rare. On thin soil on rocks. Probably best treated as a form of *C. perfoliata*. Ozol Rock (DGK 03.046).

Claytonia perfoliata Donn ex Willd. subsp. *perfoliata*. Pervasive. Shady banks and on north-facing slopes. Alhambra Valley (UC 1300963); Edwards Canyon; Franklin Canyon; Mount Wanda (JOMU 4569); Muir Grave; Ozol Rock (DGK 03.054).

Moraceae

**Ficus carica* L. Rare. Along streams, possibly spreading. Bull Valley (DGK 06.580).

Myrsinaceae

1. Lvs alternate. *Glaux maritime*
 1' Lvs opposite or whorled 2
 2. Lvs opposite; corollas orange (rarely
 indigo) *Anagallis arvensis*
 2' Lvs whorled; corollas pink, fading to
 white *Trientalis latifolia*

**Anagallis arvensis* L. Pervasive. Gardens and other disturbed areas. Luzon (AGM 215); Mount Wanda (JOMU 4571); Muir Grave; Muir House.

Glaux maritime L. Rare (historic). Brackish marshes. Possibly eradicated from the study area, but to be searched for in suitable habitat. Benicia (SJSU 8211, 1976); Martinez (JEPS 43109, 1900).

Trientalis latifolia Hook. Rare. Mesic, shaded banks. McHarry Ranch Road; Vaca Canyon (AGM 264).

Myrtaceae

1. Lvs blue-green; frs > 2 cm, warty
 *Eucalyptus globulus*

1' Lvs green; frs < 1 cm, smooth *Eucalyptus camaldulensis*

**Eucalyptus camaldulensis* Dehnh. Rare. Seedlings under planted trees. Mare Island.

**Eucalyptus globulus* Labill. Common. Planted extensively and producing spontaneous seedlings near parent trees. Mare Island (DGK 05.015); Mount Wanda; Pinole Creek (JEPS 96222).

Oleaceae

1. Lvs simple 2

1' Lvs pinnately compound (*Fraxinus*) 5

2. Lf margins finely toothed, blades <3 cm long; fls in axillary umbels *Forestiera pubescens*

2' Lf margins entire, blades >3 cm long; fls in racemes or panicles 3

3. Lf margins revolute; branchlets w/ scurfy hairs *Olea europaea*

3' Lvs margins not revolute; branchlets smooth (*Ligustrum*). 4

4. Lvs >3 cm diam; lf apices acute *Ligustrum lucidum*

4' Lvs <3 cm diam; lf apices obtuse *Ligustrum sinense*

5. Fr wings broadly oblanceolate *Fraxinus angustifolia*

5' Fr wings narrowly ovate to linear (end truncate) 6

6. Lflets distinctly stalked; frs <3 cm *Fraxinus velutina*

6' Lflets relatively short-stalked or sessile; frs >3 cm. *Fraxinus latifolia*

Forestiera pubescens Nutt. Rare. Rocky ravines in shade. Rankin Park (DGK 07.635).

**Fraxinus angustifolia* Vahl. Rare. Spreading via seed from street trees to nearby streams. Martinez (DGK 05.250).

Fraxinus latifolia Benth. Rare. Along streams. To be expected in perennial streams flowing into the Bay. Pinole Creek (DGK 03.143).

**Fraxinus velutina* Torr. Rare. Spreading via seed from street trees to nearby streams. Martinez (DGK 05.249).

**Ligustrum lucidum* W. T. Aiton. Rare. Creeks and streams. Martinez (DGK 05.234).

**Ligustrum sinense* Hassk. Rare. Filled salt marshes. Giant Marsh (DGK 05.207).

**Olea europaea* L. Uncommon. Ravines. Mount Wanda (JOMU 4688); Rankin Park (DGK 04.001); Selby (DGK 06.322b); Mount Wanda.

Onagraceae

1. Sepals persistent; hypanthium absent; pls emergent aquatics *Ludwigia peploides* subsp. *peploides*

1' Sepals deciduous; hypanthium present; pls terrestrial 2

2. Corollas yellow 3

2' Corollas pink or red 5

3. Stigmas cruciform *Oenothera elata*

3' Stigmas capitate 4

4. Caulescent annuals; corollas <5 mm *Camissoniopsis micrantha*

4' Acaulescent perennials; corollas >10 mm *Taraxia ovata*

5. Seeds tufted; sepals erect at anthesis; fls <1 cm diam (longer in *E. canum*) (*Epilobium*) 6

5' Seeds not tufted; sepals reflexed, often accrescent; fls >1 cm diam (*Clarkia*) 8

6. Corollas pink, lobes spreading 7

6' Corollas red, lobes erect (fls tubular) *Epilobium canum* subsp. *canum*

7. Gen canescent perennials; stem not peeling; moist spots *Epilobium ciliatum* subsp. *ciliatum*

7' Glandular annuals; stem peeling; roadsides and other dry spots *Epilobium brachycarpum*

8. Petals lobed 9

8' Petals entire 10

9. Petals two-lobed *Clarkia biloba* subsp. *biloba*

9' Petals three-lobed *Clarkia concinna* subsp. *concinna*

10. Petals w/ distinct claws *Clarkia unguiculata*

10' Petals w/o distinct claws 11

11. Fls <3 cm diam 13

11' Fls >3 cm diam 12

12. Corollas pale pink *Clarkia purpurea* subsp. *purpurea*

12' Corollas deep pink or bicolored (pale pink and deep pink) *Clarkia amoena*

13. Sepals free or accrescent in 2 s *Clarkia purpurea* subsp. *quadrivulnera*

13' Sepals all (4) accrescent *Clarkia affinis*

Camissoniopsis micrantha (Spreng.) W. L. Wagner & Hoch. Rare (historic). Grasslands. Probably no longer extant in the study area. Martinez (UC 20498, 1862).

Clarkia affinis F. H. Lewis & M. R. Lewis. Occasional. Grasslands and roadcuts. In the study area, this taxon and *C. purpurea* subsp. *quadrivulnera* are difficult to distinguish. Beaver Ravine (DGK 05.306); Mount Wanda (JOMU 4499); Pinole Peak (AGM 273); Port Costa (AGM 85).

**Clarkia amoena* (Lehm.) A. Nelson & J. F. Macbr. Rare. Grasslands in the west. Local collections match the horticultural variety; these represent waifs persisting from wildflower seed mixes. Crockett.

Clarkia biloba (Durand) A. Nelson & J. F. Macbr. subsp. *biloba*. Occasional. Steep slopes and roadcuts. Local populations represent a disjunct distribution from the species' typical habitat in the Sierra foothills. Eckley (DGK 00.142); Port Costa (JEPS 43823); Vaca Canyon (DGK 03.124).

Clarkia concinna (Fisch. & C. A. Mey.) Greene subsp. *concinna*. Uncommon. Mesic, shady banks. McHarry Ranch Road (AGM 80); Vaca Canyon (AGM 117).

Clarkia purpurea (Curtis) A. Nelson & J. F. Macbr. subsp. *purpurea*. Uncommon. Banks and roadcuts. Cañada del Cierbo; Martinez (CAS 71876); Pinole Creek (CAS 767967); Pinole Peak (AGM 294).

Clarkia purpurea (Curtis) A. Nelson & J. F. Macbr. subsp. *quadrivulnera* (Douglas ex

Lindl.) F. H. Lewis & M. R. Lewis. Common. Grassy slopes. Cañada del Cierbo (DGK 04.186); Carquinez Scenic Drive; Martinez (DGK 05.241); Pinole Creek.

Clarkia unguiculata Lindl. Occasional. Nearly vertical slopes and banks in the west. Franklin Canyon (AGM 81); Mount Wanda (JOMU 4501); Rodeo Creek.

Epilobium brachycarpum C. Presl. Pervasive. Compacted soils and along roads. This native annual behaves like an introduced weed. Mare Island (AGM 176); Mount Wanda; Pacheco Marsh (DGK 04.336).

Epilobium canum (Greene) P. H. Raven subsp. *canum*. Uncommon. Steep slopes. Mare Island (DGK 05.341); Selby (AGM 197).

Epilobium ciliatum Raf. subsp. *ciliatum*. Common. Wet, sunny areas. Benicia; Lake Herman (DGK 04.240); Muir House; Pinole Creek (DGK 03.142); Refugio Valley (AGM 295).

**Ludwigia peploides* (Kunth) P. H. Raven subsp. *peploides*. Rare. Ponds. Port Costa (DGK 04.299).

Oenothera elata Kunth subsp. *hookeri* (Torr. & A. Gray) W. Dietr. & W. L. Wagner. Rare. Along creek channels in sun. Vallejo (DGK 04.264).

Taraxia ovata (Torr. & A. Gray) Small. Uncommon. Low grasslands in the west. Luzon (AGM 221); Mare Island (DGK 05.017); Point Pinole; Rodeo Point (DGK 03.086).

Orobanchaceae

1. Pls parasitic, yellowish brown w/o photosynthetic lvs. *Orobanche uniflora*
- 1' Pls hemiparasitic, green to purplish red, w/ photosynthetic lvs 2
2. Lower corolla lobes distinct, not inflated; fl bracts green, not showy 3
- 2' Lower corolla lobes inflated or indistinct; fl bracts gen not green, showy 4
3. Corollas pink *Bellardia trixago*
- 3' Corollas yellow *Parentucellia viscosa*
4. Corolla beak-tips closed; stigma not expanded; salt marshes *Chloropyron molle* subsp. *m.*
- 4' Corolla beak-tips open; stigma expanded; not salt marshes (exc *Castilleja ambigua* subsp. *ambigua*) 5
5. Pollen sacs 1 per anther (*Triphysaria*) 6
- 5' Pollen sacs 2 per anther 8
6. Pls <6 cm, corollas inconspicuous, purple (occ w/ yellow marks); corolla beaks hooked. *Triphysaria pusilla*
- 6' Pls >5 cm; corollas conspicuous, yellow; corolla beaks not hooked. 7
7. Fl bracts and galea (upper lip) wine-red *Triphysaria eriantha* subsp. *e.*
- 7' Fl bracts and galea green *Triphysaria versicolor* subsp. *faucibarbata*
8. Pollen sacs attached at same level; lvs deeply pinnatifid *Pedicularis densiflora*
- 8' Pollen sacs attached at different levels; lvs lobed (*Castilleja*) 9
9. Perennials. 10

- 9' Annuals 12
10. Shrubs or subshrubs; pls densely tomentose *Castilleja foliolosa*
- 10' Herbs; pls glabrous to hairy 11
11. Bract tips acute, usually orange-red; pls not glandular *Castilleja affinis* subsp. *affinis*
- 11' Bract tips obtuse, usually yellow; pls glandular *Castilleja wightii*
12. Inflorescence yellow *Castilleja rubicundula* subsp. *lithospermoides*
- 12' Inflorescence white, pink, or maroon 13
13. Lvs >3 mm wide; salt marshes *Castilleja ambigua* subsp. *ambigua*
- 13' Lvs <3 mm wide; upland habitats (typically grasslands and oak woodlands) 14
14. Upper corolla lips densely hairy; beaks hooked. *Castilleja exserta* subsp. *exserta*
- 14' Upper corolla lips glabrous or puberulent; beaks straight 15
15. Corollas ± narrower at tip; bracts green with white tips; corollas white w/ yellow and purple spots; stigmas not exserted. *Castilleja attenuata*
- 15' Corollas broader at tip; bracts white-maroon; corollas purple (gen w/ yellow on lower lip); stigmas exserted *Castilleja densiflora* subsp. *densiflora*

**Bellardia trixago* (L.) All. Common. Disturbed grassland. Franklin Canyon (JEPS 21967); Martinez (JEPS 11296); Mount Wanda (JOMU 4609); Pinole (JEPS 74805).

Castilleja affinis Hook. & Arn. subsp. *affinis*. Uncommon. Grassy slopes. Eckley (DGK 04.070); Mount Wanda; Ozol Rock (DGK 03.047); Pinole Peak (AGM 292); Point Pinole (DGK 05.052).

Castilleja ambigua Hook. & Arn. subsp. *ambigua*. Rare. Tidal flats. The loss of tidal salt marshes in the study area has led to this plant's rarity. Martinez (UC 27158, 1900); Point Pinole (UC 1779741).

Castilleja attenuata (A. Gray) T. I. Chuang & Heckard. Occasional. Grasslands. Crockett, 5th Street Prairie (DGK 04.060b); Franklin Canyon (DGK 05.164); Martinez (UC 41755); Mount Wanda (AGM 75); Pinole (JEPS 74804).

Castilleja densiflora (Benth.) T. I. Chuang & Heckard subsp. *densiflora*. Occasional. Grasslands. Cummings Skyway (DGK 03.372); Pinole (JEPS 19440); Rodeo Point (DGK 03.082).

Castilleja exserta (A. Heller) T. I. Chuang & Heckard subsp. *exserta*. Common. Grasslands. Locally, this plant tends to be rather sparsely distributed, but in other areas of the East Bay it can be dominant in favorable years. Cañada del Cierbo (DGK 04.187); Franklin Canyon (DGK 05.162); Martinez (DGK 05.239); Mount Wanda (JOMU 4613); Pinole (JEPS 19496); Rodeo Creek (DGK 05.144); Vallejo.

Castilleja foliolosa Hook. & Arn. Uncommon. Chaparral. Cañada del Cierbo (DGK 04.094); Mare Island (DGK 05.026); Mount Wanda (JOMU 4617).

Castilleja rubicundula (Jeps.) T. I. Chuang & Heckard subsp. *lithospermoides* (Benth.) T. I. Chuang & Heckard. Rare. Disturbed grasslands. Franklin Ridge (AGM 114).

Castilleja wightii Elmer. Rare. Shaded banks. Vaca Canyon (AGM 116).

Chloropyron molle (A. Gray) A. Heller subsp. *molle*. Rare. High tidal zone of brackish marshes. This is a federally endangered species (U.S. Fish and Wildlife Service 2005). Point Pinole; Mare Island (GH78212, 1853); Southampton Marsh (SBBG 83402).

Orobanche uniflora L. Rare. Banks in light shade. Mount Wanda (JOMU 4503).

**Parentucellia viscosa* (L.) Caruel. Rare. Grasslands. Mare Island (DGK 04.084).

Pedicularis densiflora Benth. ex Hook. Rare. Partly shaded banks. This species is often a hemiparasite of *Arbutus* or *Arctostaphylos*, but the local colony currently grows near *Quercus agrifolia*. West of Ozol Rock (DGK 03.041).

Triphysaria eriantha (Benth.) T. I. Chuang & Heckard subsp. *eriantha*. Rare. Seasonally wet flats. Luzon (DGK 05.074); Rodeo Creek.

Triphysaria pusilla (Benth.) T. I. Chuang & Heckard. Pervasive. Grazed grasslands. Often found along fire roads. Cummings Skyway (DGK 03.346); Mare Island (DGK 05.032); Mount Wanda (JOMU 4627); Point Pinole.

Triphysaria versicolor Fisch. & C. A. Mey. subsp. *faucibarbata* (A. Gray) T. I. Chuang & Heckard. Occasional. Grassy slopes. Franklin Canyon; Giant Marsh; Pinole Peak; Rodeo Creek; Vallejo.

Oxalidaceae

- 1. Pls erect; cormose; fls >10 mm diam. *Oxalis pes-caprae*
- 1' Pls decumbent; stoloniferous; fls <10 mm diam *Oxalis corniculata*

**Oxalis corniculata* L. Common. Gardens. It is usually introduced as a weed in nursery stock. One form has red leaves and stems. Crockett (DGK 05.375); Vallejo (DGK 05.119).

**Oxalis pes-caprae* L. Pervasive. Gardens and disturbed soils. Spreads via bulblets. The species itself is tristylous and sexually reproducing populations are rare even in its homeland of South Africa. Crockett (DGK 05.375); Mare Island (DGK 05.014); Mount Wanda; Ozol Rock (DGK 03.053).

Papaveraceae

- 1. Fls actinomorphic 2
- 1' Fls zygomorphic 5
 - 2. Sepals glabrous, subtended by disk *Eschscholzia californica*
 - 2' Sepals hairy, not subtended by disk 3
 - 3. Styles 5–15; corollas cream w/ yellow. *Platystemon californicus*
 - 3' Style single; corollas orange or red 4
 - 4. Stigma sessile; corollas red... *Papaver rhoes*

- 4' Style elongated; corollas orange *Papaver heterophyllum*
- 5. Corollas pink; perennials; lvs mostly basal .. *Dicentra formosa*
- 5' Corollas white; climbing annuals; caudine lvs many *Fimaria capreolata*

**Dicentra formosa* (Haw.) Walp. Rare. Occasionally planted and appearing spontaneous. Muir Grave.

Eschscholzia californica Cham. Common. Grasslands. Luzon (DGK 06.335); Mare Island; Mount Wanda (JOMU 4505); Muir Grave; Muir House; Vallejo (DGK 09.213).

**Fimaria capreolata* L. Common. Gardens and disturbed soils in partial shade. Crockett (DGK 05.374); Giant Marsh (DGK 05.208); Point Pinole; Vallejo.

**Papaver rhoes* L. Rare. Disturbed soils. Occasionally persisting for a 2–3 years in disturbed soils after introduction in wildflower mixtures. Martinez.

Platystemon californicus Benth. Rare. Grasslands. Generally outcompeted by non-native, annual grasses. Benicia (JEPS 51600); Pinole Valley (DGK 04.034).

Papaver heterophyllum (Benth.) Greene. Rare (historic). Partly shaded banks. Alhambra Valley (CAS 49351, 1887); Crockett (ND-G 020290, 1895); Martinez (CAS 396323, 1883); Martinez, Muir Station (UC 72722, 1904).

Phrymaceae

- 1. Shrubs; corollas yellow-orange *Mimulus aurantiacus* var. *aurantiacus*
- 1' Herbs; corollas yellow *Mimulus guttatus*

Mimulus aurantiacus Curtis var. *aurantiacus*. Pervasive. Northern coastal scrub. Crockett (UC 26691); Crockett, 5th Street Prairie (DGK 05.383); Eckley; Franklin Canyon; Mare Island; Mount Wanda (JOMU 4623); Muir House (UC 76079).

Mimulus guttatus DC. Uncommon. Wet areas. Most local plants belong to the perennial form. *M. cardinalis* Benth. (with red vs. yellow flowers) is found in the channel of Wildcat Creek 4 km south of the study area and might be expected in similar habitats in the study area. McEwen Road (AGM 253); Pinole Valley; Vallejo (DGK 04.276).

Plantaginaceae

- 1. Fls not showy; perianth translucent, brown or lacking 2
- 1' Fls showy; corollas blue, white, or purple 8
 - 2. Perianth lacking; pistil 2-lobed *Callitricha marginata*
 - 2' Perianth translucent, brown; pistil not 2-lobed (*Plantago*) 3
 - 3. Lvs lobed *Plantago coronopus*
 - 3' Lvs not lobed 4
 - 4. Lvs linear to narrowly ovate 5
 - 4' Lvs broadly ovate 7

5. Hairy annuals *Plantago erecta*
 5' Subglabrous perennials 6
 6. Lvs 3-veined, fleshy; spikes not narrower
 at tips *Plantago maritima*
 6' Lvs 5-veined, not fleshy; spikes narrower
 at tip *Plantago lanceolata*
 7. Petioles not winged *Plantago major*
 7' Petioles winged *Plantago subnuda*
 8. Lvs mostly opposite (*Veronica*) 9
 8' Lvs mostly alternate 11
 9. Inflorescences axillary racemes 10
 9' Fls single, borne in axils of lvs *Veronica persica*
 10. Lvs sessile *Veronica anagallis-aquatica*
 10' Lvs petiolate *Veronica americana*
 11. Corollas long-spurred, spurs 3–5 mm 12
 11' Corollas short-spurred, spurs <3 mm 16
 12. Pls erect; pedicels <than fls 13
 12' Pls prostrate; pedicels >than fls 14
 13. Fls <1 cm; lvs grass green, not glaucous . . .
 *Nuttallanthus texanus*
 13' Fls >1 cm; lvs bluish, slightly glaucous . . .
 *Linaria purpurea*
 14. Pls glabrous; sinuous vines
 *Cymbalaria muralis*
 14' Pls hairy; sprawling herbs (*Kickxia*) 15
 15. Lvs hastate; fl spurs straight *Kickxia elatine*
 15' Lvs ovate to subcordate; fl spurs curved . . .
 *Kickxia spuria*
 16. Spurs on lower side of corollas
 *Antirrhinum vexillocalyculatum* subsp. *vexillocalyculatum*
 16' Spurs on upper side of corollas (*Collinsia*) 17
 17. Fls clustered; petioles shorter than fls
 *Collinsia heterophylla* var. *heterophylla*
 17' Fls single; petioles longer than fls
 *Collinsia sparsiflora* var. *sparsiflora*

Antirrhinum vexillocalyculatum Kellogg subsp. *vexillocalyculatum* (*Sairocarpus vexillo-calyculatus* [Kellogg] D.A. Sutton). Rare. Nearly vertical banks in sun. Franklin Canyon (DGK 04.330); Vallejo (CAS 151167).

Callitricha marginata Torr. Rare. Winter puddles and small ponds. Franklin Canyon (DGK 05.034b).

Collinsia heterophylla Buist ex Graham var. *heterophylla*. Occasional. Shaded slopes. Crockett (DGK 05.231); McEwen Road (UC 1301183); Mount Wanda (JOMU 4619); Ozol Rock (DGK 04.129); Pinole Peak (AGM 289).

Collinsia sparsiflora Fisch. & C. A. Mey. var. *sparsiflora*. Rare. Shaded banks. Mount Wanda (JOMU 4621); Pinole Peak (JOMU 4619).

**Cymbalaria muralis* P. Gaertn. B. Mey. & Scherb. Uncommon. Garden rocks and retaining walls. Crockett (DGK 05.376).

**Kickxia elatine* (L.) Dumort. Uncommon. Disturbed areas. Mount Wanda (JOMU 4697); Muir House; Pinole Creek (DGK 03.131).

**Kickxia spuria* (L.) Dumort. Rare. Disturbed areas. Mare Island (AGM 168).

**Linaria purpurea* (L.) Miller. Rare. Grasslands along streams. Edwards Canyon, Crockett.

**Nuttallanthus texanus* (Scheele) D. A. Sutton [*Linaria texana* Scheele]. Rare. Rocks in chaparral. Mount Wanda; Ozol Rock (DGK 05.278).

**Plantago coronopus* L. Rare. Saline soils in the east. Martinez (JEPS 22058); Pacheco Marsh (AGM 318).

Plantago erecta E. Morris. Uncommon. Sunny spots where annual grasses are not too dense. Crockett, 5th Street Prairie (DGK 04.062); Franklin Canyon (DGK 05.156); Ozol Rock (DGK 03.074); Rodeo Point (DGK 03.088).

**Plantago lanceolata* L. Common. Grasslands, especially in the west. Franklin Canyon (JEPS 22023); Mare Island (DGK 05.362); Mount Wanda (JOMU 4481); Muir House; Pinole Peak (AGM 271).

**Plantago major* L. Occasional. Freshwater wetlands in sunny patches. Cañada del Cierbo (DGK 04.103); Martinez (DGK 04.227); Muir Grave; Muir House.

Plantago maritima L. Rare (historic). Saline soils. Martinez (UC 28020, 1862; UC 28022, 1900).

Plantago subnuda Pilg. Rare. Salt marshes. Martinez (DGK 03.115).

Veronica americana Schwein. ex Benth. Occasional. Along perennial streams. Alhambra Valley (DGK 04.158); Fernandez Ranch; Pinole Creek (DGK 03.141).

**Veronica anagallis-aquatica* L. Common. Along streams and in shallow ponds. Crockett; Lake Herman (DGK 04.253).

**Veronica persica* Poir. Uncommon. Fire roads and rough lawns. Mount Wanda; Muir Grave; Sky Ranch; Vallejo (DGK 05.117).

Platanaceae

Platanus racemosa Nutt. Uncommon. Along streams. Martinez (UC 367125); Vaca Canyon (DGK 03.122).

Plumbaginaceae

Limonium californicum (Boiss.) A. Heller. Rare. High tidal salt marshes. The filling of the habitat of this species has led to its current rarity. Benicia (JEPS 20266, 1891); Mare Island (AGM 184); Point Pinole.

Polemoniaceae

1. Lvs opposite 2
- 1' Lvs alternate 5
2. Lvs entire; corolla lobes notched
 *Microsteris gracilis*
- 2' Lvs divided into linear segments; corolla lobes not notched (*Leptosiphon*) 3
3. Corolla lobes >5 mm *Leptosiphon androsaceus*
- 3' Corolla lobes <5 mm 4
4. Calyx sinus membranes narrower than calyx lobes; corollas white to pale pink . .
 *Leptosiphon bicolor*
- 4' Calyx sinus membranes wider than calyx lobes; corollas pink *Leptosiphon ciliatus*

5. Lvs and bracts prickly (*Navarretia*) 6
 5' Lvs and bracts not prickly (*Gilia*) 7
 6. Calyx lobes entire; pls w/ skunk-like odor *Navarretia squarrosa*
 6' Calyx lobes lobed; pls w/o skunk-like odor *Navarretia pubescens*
 7. Fls in heads; corollas w/ darker veins
 *Gilia achilleifolia* subsp. *achilleifolia*
 7' Fls in cymes; corollas w/o darker veins
 *Gilia clivorum*

Gilia achilleifolia Benth. subsp. *achilleifolia* Rare (historic). Grasslands. Vallejo (ND-G 041254, 1874).

Gilia clivorum (Jeps.) V. E. Grant. Rare. Grasslands. Mount Wanda (JOMU 4551).

Leptosiphon androsaceus Benth. (*Linanthus a.* [Benth.] Greene). Rare. Grasslands. Known only from older collections. Alhambra Valley (CAS 400970, 1971); Vallejo (CAS 17003).

Leptosiphon bicolor Nutt. (*Linanthus b.* [Nutt.] Greene). Rare. Moist, grassy, north-facing slopes. Fernandez Ranch (DGK 05.088); Mount Wanda; Rodeo Creek (DGK 05.131).

Leptosiphon ciliatus (Benth.) Jeps. (*Linanthus c.* [Benth.] Greene). Rare (historic). Grasslands. Pinole Valley (UC 1618093, 1937).

Navarretia pubescens (Benth.) Hook. & Arn. Rare (historic). Grasslands. Martinez (UC 106833, 1892).

Navarretia squarrosa (Eschsch.) Hook. & Arn. Occasional. Edges of northern coastal scrub. The skunk-like odor of this plant can often be detected at some distance. Cummings Skyway (DGK 05.329); Edwards Canyon (DGK 05.191); Ozol Rock (DGK 05.266); Pinole Peak.

Microsteris gracilis (Hook.) Greene (*Phlox g.* [Hook.] Greene). Rare. Mesic, grassy slopes. Mount Wanda (JOMU 4553); Port Costa (UC 52449).

7' Inner tepal broadly ovate to triangular; fr tubercles narrower than tepal margin *Rumex crispus*
 8. Lvs $>4 \times$ longer than wide; tepal teeth length $>1.5 \times$ tepal width . . . *Rumex fuegimis*
 8' Lvs $<4 \times$ longer than wide; tepal teeth length gen $<$ tepal width 9
 9. Annuals; lf bases subcordate to truncate
 *Rumex obtusifolius*
 9' Perennials; lf bases cordate 10
 10. Lf blades <15 cm; tepal tubercles wrinkled
 *Rumex pulcher*
 10' Lf blades >20 cm; tepal tubercles smooth
 *Rumex dentatus*
 11. Inflorescences a dense spike; corollas showy (*Persicaria*) 12
 11' Inflorescences a loose spike or raceme; corollas inconspicuous 15
 12. Annuals; tepals w/ gland dots
 *Persicaria hydropiper*
 12' Annuals or perennials; tepals w/o gland dots 13
 13. Inflorescences >7 mm diam; corollas rose pink
 *Persicaria amphibia*
 13' Inflorescences <7 mm diam; corollas pale pink to white 14
 14. Corollas greenish white; annuals
 *Persicaria lapathifolia*
 14' Corollas light pink; perennials
 *Persicaria hydropiperoides*
 15. Lvs >5 mm wide; lf bases sagittate
 *Fallopia convolvulus*
 15' Lvs <4 mm wide; lf bases not sagittate (*Polygonum*) 16
 16. Distal floral bract length $<$ fl length
 *Polygonum ramosissimum*
 16' Distal floral bracts length $>$ fl length (*Polygonum aviculare*) 17
 17. Fls $<1.5 \times$ long as wide; outer tepals pouched at base; ochreous persisting, silvery . . . *Polygonum aviculare* subsp. *buxiforme*
 17' Fls $>1.5 \times$ long as wide; outer tepals not pouched; ochreous soon shredding into fibers 18
 18. Tepal margins white, veins unbranched
 *Polygonum aviculare* subsp. *depressum*
 18' Tepal margins gen pink, veins branched
 *Polygonum aviculare* subsp. *neglectum*

**Eriogonum fasciculatum* Benth. var. *foliolosum* (Nutt.) S. Stokes ex Abrams. Rare. Slopes. Persisting and rarely spreading as a waif from slope-stabilization seed mixes. The closest native occurrence of this species is at Corral Hollow, about 70 km southeast of the study area. Luzon (AGM 233); I-80 at Crockett. *E. arborescens* Greene, from the California Channel Islands, was planted in the 1950's along I-80 just south of Crockett and is reproducing from seed after a fire; it is distinguished by its more divaricate branching and wide inflorescences, >10 cm across.

1. Vining annuals; lvs opposite
 *Pterostegia drymarioides*

1' Annual or perennial herbs; lvs alternate 2
 2. Nodes w/o membranous sheath; fls in involucres (*Eriogonum*) 3
 2' Nodes w/ membranous sheath; fls not in involucres 4
 3. Pls >60 cm; lvs linear
 *Eriogonum fasciculatum* var. *foliolosum*

3' Pls <50 cm; lvs broadly ovate
 *Eriogonum nudum* var. *auriculatum*

4. Tepals 6 (*Rumex*) 5
 4' Tepals 4–5 11

5. Lf bases hastate; pls dioecious *Rumex acetosella*

5' Lf bases acute to obtuse; pls monoecious 6
 6. Tepal margins entire 7
 6' Tepal margins toothed 8
 7. Inner tepals narrowly oblong; largest fr tubercles about as wide as tepal margin
 *Rumex conglomeratus*

Eriogonum nudum Douglas ex Benth. var. *auriculatum* (Benth.) J. P. Tracy ex Jeps. Common. Steep banks and cliffs in grasslands. Benicia (DGK 04.242); Crockett (UC 1607640); Glen Cove Shore (DGK 05.302); Mare Island (AGM 93); Mount Wanda; Ozol Rock; Pinole Peak (AGM 293); Port Costa; Selby.

**Fallopia convolvulus* (L.) A. Löve [*Polygonum c.* L.]. Rare. Disturbed ground. This is a common weed in the eastern U.S., but it is not well adapted to the dry conditions in most of California. Observed once in Crockett and evidently extirpated.

Persicaria amphibia (L.) A. Gray [*Polygonum amphibium* L.]. Rare. Shallow water. Lake Herman (DGK 04.238).

**Persicaria hydropiper* (L.) Delarbre [*Polygonum h.* L.]. Rare. Stock ponds and other disturbed wetlands. Fernandez Ranch.

Persicaria hydropiperoides (Michx.) Sm. [*Polygonum h.* Michx.]. Rare. Creeks. To be expected in other wet areas. Martinez (DGK 04.228).

Persicaria lapathifolia (L.) A. Gray [*Polygonum lapathifolium* L.]. Rare locally. Lake Herman (DGK 04.255).

**Polygonum aviculare* L. subsp. *buxiforme* (Small) Costea & Tardif. Occasional. High brackish marshes and adjacent areas. Pacheco Marsh; Southampton Marsh (DGK 05.487).

**Polygonum aviculare* L. subsp. *depressum* (Meissner) Archang. [*Polygonum arenastrum* Jord. ex Boreau]. Common. Waste ground. Crockett (DGK 04.290a); Mount Wanda (JOMU 4554).

**Polygonum aviculare* L. subsp. *neglectum* (Besser) Archang. Occasional. Irrigated fields and on the edges of stock ponds. Fernandez Ranch; Muir House.

Polygonum ramosissimum Michx. Rare. Salt marshes. An anomalous narrow-leaved form of this species according to Mihai Costea. Pacheco Marsh (DGK s.n.).

Pterostegia drymarioides Fisch. & C. A. Mey. Uncommon. Rocks in scrub or grasslands. Cummings Skyway (DGK 03.360); Mare Island (DGK 05.025); Ozol Rock (DGK 04.108).

**Rumex acetosella* L. Pervasive. Grasslands. Luzon (AGM 225); Mare Island (AGM 96); Mount Wanda (JOMU 4557).

**Rumex conglomeratus* Murray. Common. Streams and cow ponds. In sun or light shade. Lake Herman (DGK 04.237); Mare Island; Martinez (DGK 05.247); McEwen Road; Vallejo.

**Rumex crispus* L. Common. Seasonally wet, disturbed ground. Benicia (UC 75684); Mare Island; Mount Wanda (JOMU 4689); Muir Grave; Muir House; Vallejo (UC 1101192).

**Rumex dentatus* L. Rare. High salt marsh. Mare Island (DGK 05.351).

Rumex fueginus Phil. Rare. Wetland margins. Hercules (CAS 641481); Lake Herman (UC 733716, 1947).

**Rumex obtusifolius* L. Rare. Along streams. Franklin Canyon (DGK 05.177); Vallejo (DGK 04.080).

**Rumex pulcher* L. Common. Seasonally moist grassland. Benicia (UC 75482); Mount Wanda

(JOMU 4558); Muir Grave; Muir House; Refugio Valley (AGM 267).

Portulacaceae

**Portulaca oleracea* L. Occasional. Gardens and agricultural areas. Crockett (DGK 05.393); Martinez Marsh (DGK 03.111); Muir Grave; Vallejo (DGK 05.118).

Primulaceae

1. Lf lengths $<2 \times$ width; corollas pink	<i>Dodecatheon hendersonii</i>
1' Lf lengths $>2 \times$ width; corollas gen white	<i>Dodecatheon clevelandii</i> subsp. <i>patulum</i>

Dodecatheon clevelandii Greene subsp. *patulum* (Kuntze) H. J. Thomps. (*Primula c.* [Greene] Mast & Reveal var. *patula* [Kuntze] Mast & Reveal). Rare (historic). Grasslands. Rodeo Valley (JEPS 21206, 1926).

Dodecatheon hendersonii A. Gray (*Primula h.* [A. Gray] Mast and Reveal). Uncommon. Lightly shaded banks. Mount Wanda (AGM 70); Ozol Rock (DGK 03.052); Rankin Park.

Ranunculaceae

1. Fls zygomorphic (<i>Delphinium</i>)	2
1' Fls actinomorphic	3
2. Corollas blue-purple	
. <i>Delphinium patens</i> subsp. <i>patens</i>	
2' Corollas red	<i>Delphinium nudicaule</i>
3. Woody vines.	<i>Clematis lasiantha</i>
3' Herbs.	4
4. Frs capsules; perianths red or greenish	5
4' Frs achenes; perianths yellow (<i>Ranunculus</i>)	6
5. Perianths red with prominent nectar spurs	
. <i>Aquilegia formosa</i>	
5' Perianths greenish, reduced.	
. <i>Thalictrum fendleri</i> var. <i>polycarpum</i>	
6. Fr body sides \pm smooth	
. <i>Ranunculus californicus</i> var. <i>californicus</i>	
6' Fr body sides papillate to spiny	7
7. Petals 5–8 mm; frs spiny	<i>Ranunculus muricatus</i>
7' Petals 1–2 mm or 0; frs papillate	
. <i>Ranunculus hebecarpus</i>	

Aquilegia formosa Fisch. ex DC. Rare. Shady banks. Vaca Canyon (AGM 254).

Clematis lasiantha Nutt. Rare. Brushy slopes. Locally this plant is associated with *Holodiscus discolor*. Martinez (RSA 135362, 1883); McHarry Ranch Road.

Delphinium nudicaule Torr. & A. Gray. Rare. Shady banks. Vaca Canyon (AGM 243). A tiny population of this species barely persists on a roadcut.

Delphinium patens Benth. subsp. *patens*. Rare. Grasslands. Mount Wanda (JOMU 4577); above Ozol Rock.

Ranunculus californicus Benth. var. *californicus*. Common. Grasslands and lightly shaded slopes. Alhambra Valley (UC 1300986); Cañada del Cierbo; Crockett (DGK 04.161);

Mount Wanda (JOMU 4579); Rodeo Creek (DGK 05.138).

Ranunculus hebecarpus Hook. & Arn. Uncommon. Brushy slopes. Edwards Canyon (DGK 05.183); Martinez (UC 480966); Pinole Valley (UC 1607964); Vaca Canyon.

**Ranunculus muricatus* L. Common. Small puddles and wet areas. Cañada del Cierbo (DGK 04.096); Franklin Canyon; Mount Wanda (JOMU 4581); Port Costa.

Thalictrum fendleri Engelm. ex A. Gray var. *polycarpum* Torr. Rare. Shaded slopes. Edwards Canyon (DGK 04.176).

Resedaceae

**Reseda alba* L. Rare. Cliffs and steep banks. Crockett (DGK 04.076); Mare Island (DGK 05.360).

Rhamnaceae

1. Frs capsules; corollas blue. *Ceanothus* 'Ray Hartman'
- 1' Frs berries; corollas green or absent 2
2. Lvs entire; petals present. *Frangula californica* subsp. *californica*
- 2' Lvs toothed; petals absent (*Rhamnus*) 3
3. Lvs <1 cm; lf tips obtuse to emarginate *Rhamnus crocea*
- 3' Lvs >1 cm; lf tips acute. *Rhamnus alaternus*

**Ceanothus* 'Ray Hartman'. Rare. Occasionally planted along roadsides and, at times, appearing native (e.g., Ozol Rock, DGK 03.059). This plant may be the origin of reports of *C. thyrsiflorus* in the Carquinez Region.

Frangula californica (Eschsch.) A. Gray subsp. *californica* [*Rhamnus c.* Eschsch.] Occasional. Northern coastal scrub and the edges of woodlands. Crockett Hills (DGK 08.249); Mare Island; Mount Wanda; Ozol Rock (DGK 03.069).

**Rhamnus alaternus* L. Uncommon. Brushy areas where it may be beginning to spread. Pinole Valley (DGK 07.569); Rodeo Shore (DGK 08.219); Vallejo (DGK 09.219).

Rhamnus crocea Nutt. Rare. On sandstone outcrops. Pinole Peak (AGM 290).

Rosaceae

1. Herbs; frs achenes 2
- 1' Trees or shrubs; frs various 8
 2. Lvs lobed, <4 mm *Aphanes occidentalis*
 - 2' Lvs compound, >20 mm 3
 3. Lvs trifoliate; frs like strawberries *Duchesnea indica* var. *indica*
 - 3' Lvs pinnately compound; frs not like strawberries 4
 4. Lflets narrow, deeply lobed; frs spiny *Acaena pinnatifida* var. *californica*
 - 4' Lflets ovate, toothed; frs not spiny 5
 5. Lvs glaucous, not dark green; fls w/o petals *Poterium sanguisorba*

- 5' Lvs not glaucous; dark green; fls w/ petals (sometimes falling early) 6
6. Petals white; terminal lflets confluent w/ those below *Horkelia californica* var. *frondosa*
- 6' Petals yellow; terminal lflets distinct 7
7. Pls not rhizomatous; fls 3–12; brushy slopes *Drymocallis glandulosa* var. *glandulosa*
- 7' Pls rhizomatous; fls single; salt marshes *Potentilla anserina* subsp. *pacifica*
8. Lvs (some or all) pinnately compound or trifoliate 9
- 8' Lvs simple 13
9. Erect shrubs; lflets <3 cm; frs achenes within fleshy hypanthium (*Rosa*) 10
- 9' Sprawling shrubs; lflets >3 cm; frs aggregations of drupelets (*Rubus*) 11
10. Prickles thick, curved; stems (all or some) >5 mm diam *Rosa californica*
- 10' Prickles thin, straight; stems gen <5 mm diam *Rosa gymnocarpa* var. *gymnocarpa*
11. Pls w/o prickles *Rubus ulmifolius* var. *anoplothyrsus*
- 11' Pls w/ prickles 12
12. Lflets mostly 5, undersides pale *Rubus bifrons*
- 12' Lflets mostly 3, undersides only slightly paler than upper surface *Rubus ursinus*
13. Lvs deeply corrugated; fls <3 mm *Holodiscus discolor*
- 13' Lvs not deeply corrugated; flowers >3 mm 14
14. Frs drupes 15
- 14' Frs follicles or pomes 23
15. Lvs entire, deciduous; carpels >2–4 per fl. *Oenleria cerasiformis*
- 15' Lvs toothed or evergreen; carpels 1 (*Prunus*) 16
16. Lvs evergreen *Prunus lyoni*
- 16' Lvs deciduous 17
17. Shrubs; petioles w/ glands 18
- 17' Small trees; petioles w/o glands 19
18. Lvs light green, broadly ovate, bases subcordate *Prunus subcordata*
- 18' Lvs dark green, ovate, bases acute. *Prunus virginiana* var. *deuissa*
19. Lvs broadly deltate *Prunus armeniaca*
- 19' Lvs lanceolate to ovate 20
20. Lvs lanceolate; frs hairy *Prunus dulcis*
- 20' Lvs ovate; frs glabrous 21
21. Fls <1 cm; February blooming *Prunus angustifolia* var. *angustifolia*
- 21' Fls >1 cm; March blooming 22
22. First-year twigs shiny, green; lvs hairless except on veins *Prunus cerasifera*
- 22' First-year twigs dull, brown; lvs hairy underneath *Prunus × domestica*
23. Frs follicles *Adenostoma fasciculatum* var. *fasciculatum*
- 23' Frs pomes 24
24. Lvs >6 cm, coarsely toothed *Heteromeles arbutifolia*
- 24' Lvs <6 cm, entire or finely toothed 25
25. Lvs 3–6 cm; frs drooping, borne singly *Pyrus calleryana*
- 25' Lvs <3 cm; frs erect, borne in flat-topped clusters 26
26. Pls w/ thorns (*Pyracantha*) 27
- 26' Pls w/o thorns (*Cotoneaster*) 28
27. Lf undersides hairy *Pyracantha angustifolia*
- 27' Lf undersides subglabrous to glabrous *Pyracantha fortuneana*

28. Corollas pink *Cotoneaster franchetii*
28' Corollas white *Cotoneaster pannosus*

Acaena pinnatifida Ruiz & Pav. var. *californica* (Bitter) Jeps. Rare. Wind-swept bluffs. Blume Hill (DGK 04.088); Mare Island (DGK 05.318).

Adenostoma fasciculatum Hook. & Arn. var. *fasciculatum* Uncommon. Ridges with thin soil. Mount Wanda, Ozol Rock (DGK 05.279); Pinole Peak.

Aphanes occidentalis (Nutt.) Rydb. Common. Grazed grasslands. Cañada del Cierbo (DGK 03.347); Mount Wanda; Pinole Valley (DGK 04.035); Sky Ranch (AGM 212).

**Cotoneaster franchetii* Bois. Uncommon. Disturbed brushy areas. Mount Wanda (JOMU 4585).

**Cotoneaster pannosus* Franch. Uncommon. North-facing slopes. Lone Tree Point (DGK 08.299).

Drymocallis glandulosa (Lindl.) Rydb. var. *glandulosa* [*Potentilla* g. Lindl. subsp. g.]. Occasional. Brushy areas. Eckley (DGK 09.153); Edwards Canyon (DGK 04.170); Mount Wanda.

**Duchesnea indica* (Andrews) Focke var. *indica*. Rare. Rough lawns. Vallejo (DGK 05.110). The native strawberry, *Fragaria californica* Cham. & Schltdl., with white (vs. yellow) petals, is found in the San Pablo Valley about 3 km to the south of the study area.

Heteromeles arbutifolia (Lindl.) M. Roem. Pervasive. Northern coastal scrub, woodlands, and chaparral. Crockett (DGK 06.322c); Franklin Canyon (DGK 03.038); Lone Tree Point (DGK 08.300); Mare Island (DGK 05.345); Mount Wanda (JOMU 4587); Vaca Canyon (DGK 04.038).

Holodiscus discolor (Pursh) Maxim. var. *discolor*. Common. Shaded, mesic slopes. Crockett; McEwen Road; Mount Wanda (JOMU 4694), Pinole Peak (AGM 274); Vaca Canyon (DGK 03.125).

Horkelia californica Cham. & Schltdl. var. *frondosa* (Greene) Ertter & Reveal. Occasional. Brushy areas. The type locality of *Potentilla frondosa* Greene is between Crockett and Martinez. Eckley (UC 1606349); Edwards Canyon (DGK 04.164); Martinez (DS 121726).

Oenothera cerasiformis (Torr. & A. Gray ex Hook. & Arn.) J. W. Landon. Occasional. In brush, usually associated with *Toxicodendron diversilobum*. Edwards Canyon; Pinole Creek (DGK 04.021); Mount Wanda (JOMU 4589); Sky Ranch (DGK 03.035).

Potentilla anserina L. subsp. *pacifica* (Howell) Rousi. Common. Along tidal channels in brackish marshes. Martinez Marsh (DGK 03.107); Southampton Marsh (DGK 03.147).

**Poterium sanguisorba* L. Rare. Wind-swept hills. Kite Hill (DGK 08.219).

**Prunus angustifolia* Marsh. var. *angustifolia*. Rare. North-facing slopes in brush. West Crockett (DGK 05.005).

**Prunus armeniaca* L. Rare. Brushy slopes. Mare Island (AGM 173); Mount Wanda.

**Prunus cerasifera* Ehrh. Common. Brushy areas. Both the red- and green-leaved forms are encountered. Crockett (DGK 05.005); Franklin Canyon (DGK 05.219); Mount Wanda (JOMU 4591); Vallejo (DGK 09.212).

**Prunus × domestica* L. Rare. Small tree on shaded slopes. Pinole Valley Rd. (DGK 07.577).

**Prunus dulcis* (Mill.) D. A. Webb. Common. Brushy slopes. Mount Wanda (JOMU 4593); near Ozol Rock (DGK 03.043); Pinole Valley (DGK 05.011).

**Prunus lyonii* (Eastw.) Sarg. Rare. Planted and reproducing spontaneously in light shade. The Island cherry is native to the California Channel Islands. Crockett; Elkhorn Creek (DGK 04.215).

Prunus subcordata Benth. Rare. Ridgetops. North of Pinole Peak (DGK 05.099).

Prunus virginiana L. var. *demissa* (Nutt.) Torr. Rare. Brushy slopes on sandstone outcrops. Pinole Peak (AGM 268).

**Pyracantha angustifolia* (Franch.) C. K. Schneid. Rare. Planted and rarely spontaneous. Martinez; Mount Wanda.

**Pyracantha fortuneana* (Maxim.) H. L. Li. Rare. Brushy slopes. Near Martinez (DGK 05.246).

**Pyrus calleryana* Decne. Rare. Brush. Commonly planted, but rarely spontaneous. Vallejo (DGK 09.211).

Rosa californica Cham. & Schltdl. Occasional. Along streams and in brackish marshes. A plant with rather straight prickles that occurs on shaded slopes may be a form of this species. Bull Valley (UC 136538); Crockett; Muir Grave; Vaca Canyon (DGK 03.123).

Rosa gymnocarpa Nutt. var. *gymnocarpa*. Occasional. Shade of oaks or eucalyptus. Franklin Canyon (DGK 08.046); Port Costa (DGK 08.046); Vaca Canyon.

**Rubus bifrons* Vest [*R. armeniacus* Focke; *R. discolor* Weihe & Nees misapplied]. Pervasive. Along streams and in disturbed areas. Mare Island; Muir Grave; Muir House; Vallejo (DGK 04.275).

**Rubus ulmifolius* Schott var. *anoplothyrsus* Sudre. Uncommon. Along streams. The unarmed blackberry may be persisting from cultivation. Elkhorn Creek; Luzon AGM307; Martinez (JEPS 66120).

Rubus ursinus Cham. & Schltdl. Occasional. On banks and in brushy areas. Cañada del Cierbo (DGK 04.199); Christie; Ozol Rock; Mount Wanda (JOMU 4595); Muir Grave; Point Pinole.

Rubiaceae

1. Corollas pink; fls sessile, >3 mm . . . *Sherardia arvensis*
- 1' Corollas greenish white; fls (some or all) pedicelled, <3 mm (*Galium*) 2
2. Lvs 4 per whorl 3
- 2' Lvs >4 per whorl 4
3. Annuals <8 cm tall; frs sausage-shaped *Galium murale*
- 3' Perennials 10–100 cm tall; frs not sausage-shaped *Galium porrigens* var. *porrigens*
4. Pls clambering; lvs >2 cm; fls in axillary clusters *Galium aparine*
- 4' Pls upright; lvs <1.5 cm; fls in panicles. *Galium parisiense*

Galium aparine L. Pervasive. Shady woodlands and weedy grasslands. Plants with ascending, acute leaves are attributable to *G. spurium* L. Cummings Skyway (DGK 03.352); Luzon (AGM 223); Mount Wanda (JOMU 4597); Muir House; Muir Grave; Point Pinole (DGK 05.053).

**Galium murale* (L.) All. Common. Grasslands. Cummings Skyway (DGK 03.345); Mount Wanda (JOMU 4599); Pinole Valley (DGK 04.036).

**Galium parisiense* L. Common. On banks and in disturbed areas. Mount Wanda; Ozol Rock (DGK 03.066).

Galium porrigens Dempster var. *porrigens*. Common. Brushy areas. Cummings Skyway (DGK 03.357); Edwards Canyon (DGK 04.168); Mount Wanda (JOMU 4601).

**Sherardia arvensis* L. Rare. Grasslands. Mare Island (DGK 05.022); McEwen Road (DGK 08.044); Vallejo (UC 1212142).

Rutaceae

Ptelea crenulata Greene. Occasional. Woodland edges and in scrub. Edwards Canyon (DGK 04.172); Mare Island (AGM 106); Martinez (JEPS 21816); Mount Wanda (JOMU 4603); Ozol Rock.

Salicaceae

1. Lvs linear to lanceolate; petioles terete in cross section; frs narrowly piriform (*Salix*) . . . 2
- 1' Lvs broadly deltate; petioles laterally flattened; frs plump, nearly as wide as long (*Populus*) 6
2. Shrubs; lvs narrowly ovate to linear 3
- 2' Shrubs to trees; lvs obovate to lanceolate . . . 4
3. Upper lf surfaces pale *Salix exigua* var. *hindsiana*
- 3' Upper lf surfaces green *Salix gooddingii*
4. Petioles w/ glands *Salix lasiandra* var. *lasiandra*
- 4' Petioles w/o glands 5
5. Lvs obovate, revolute *Salix lasiolepis*
- 5' Lvs lanceolate, not revolute *Salix laevigata*
6. Lvs glabrous *Populus fremontii* subsp. *fremontii*
- 6' Lvs tomentose underneath *Populus alba*

**Populus alba* L. Rare. Persisting as root sprouts from plantings. Giant Marsh (DGK 05.205).

Populus fremontii S. Watson subsp. *fremontii*. Uncommon. Along streams. Mare Island (AGM 165); Martinez (DGK 05.236); McEwen Road; Ozol (DGK 04.129b).

Salix exigua Nutt. var. *hindsiana* (Benth.) Dorn. Rare. Along perennial streams. Blume Hill; Lake Herman (DGK 04.244).

Salix gooddingii Ball. Rare. Disturbed creek channels. Vallejo (DGK 09.216).

Salix laevigata Bebb. (*Salix bonplandiana* Kunth var. *laevigata* [Bebb] Dorn). Occasional. Along streams. Glen Cove (DGK 05.287); Franklin Canyon (DGK 05.221); Mount Wanda; Muir House (DGK 05.244); Muir Grave; Refugio Valley (AGM 283).

Salix lasiandra Benth. var. *lasiandra*. Uncommon. Bordering marshes. Southampton Marsh (DGK 09.346).

Salix lasiolepis Benth. Common. Along streams and ponds. Cañada del Cierbo (DGK 04.198); Edwards Canyon; Franklin Canyon (AGM 208); Kite Hill (DGK 07.208); Mount Wanda (UC 1196651); Muir House.

Sapindaceae

1. Frs single-seeded capsules . . . *Aesculus californica*
- 1' Frs pairs of samaras (*Acer*) 2
2. Lvs pinnately compound *Acer negundo*
- 2' Lvs palmately lobed *Acer macrophyllum*

Acer macrophyllum Pursh. Uncommon. Along perennial streams. Carquinez Scenic Drive Crockett; Edwards Canyon; Ozol Rock (DGK 04.109); Sky Ranch; (DGK 04.015).

Acer negundo L. Roadsides. Pig Sale; Rodeo Creek (DGK 05.155).

Aesculus californica (Spach) Nutt. Pervasive. North-facing slopes. Crockett; Port Costa; Mount Wanda (JOMU 4461); Muir Grave; Muir House.

Saururaceae

Anemopsis californica (Nutt.) Hook. & Arn. Rare. Along sloughs. Alhambra Creek near the train station in Martinez (DGK 04.226), where it may have been planted.

Saxifragaceae

1. Lvs simple, not lobed; petals not lobed; placentation axile *Micranthes californica*
- 1' Lvs deeply lobed to compound; petals lobed; placentation parietal (*Lithophragma*) 2
2. Hypanthium bases campanulate *Lithophragma heterophyllum*
- 2' Hypanthium bases obconic *Lithophragma affine*

Lithophragma affine A. Gray. Occasional. Grassy slopes. Cummings Skyway (DGK 03.358); Mount Wanda (JOMU 4489); Martinez (UC 402493); Pinole Valley (DGK 04.024); Vaca Canyon (AGM 259).

Lithophragma heterophyllum (Hook. & Arn.) Torr. & A. Gray. Occasional. Shady slopes. Franklin Canyon (DGK 05.033); Mount Wanda; Vaca Canyon (AGM 240).

Micranthes californica (Greene) Small [Saxifraga c. Greene]. Rare. Shady banks. Mount Wanda (JOMU 4607).

Scrophulariaceae

1. Inflorescences spikes or racemes. *Verbascum thapsus*
- 1' Inflorescences thyrses *Scrophularia californica*

Scrophularia californica Cham. & Schltdl. Common. In scrub and on partly shaded banks. Kite Hill (DGK 05.326); Mare Island; McEwen Road (UC 1301209); Mount Wanda (JOMU 4625); Ozol Rock (DGK 03.041).

**Verbascum thapsus* L. Rare. Disturbed ground. It persists where established, but does not spread appreciably. Franklin Canyon (DGK 05.175); Martinez (AGM 312).

Simaroubaceae

**Ailanthus altissima* (Mill.) Swingle. Uncommon. Roadsides and disturbed areas. The tree-of-heaven persists where planted and spreads via root sprouts. Glen Cove Shore; Mount Wanda (JOMU 4724).

Solanaceae

1. Flowers >3 cm; fruits capsules 2
- 1' Flowers <3 cm; fruits berries 3
2. Flowers >12 cm; corollas white . . . *Datura wrightii*
- 2' Flowers <6 cm; corollas yellow . . . *Nicotiana glauca*
3. Corolla tubes >limbs 4
- 3' Corolla tubes <limbs (*Solanum*) 5
4. Vines; corollas urceolate, white. *Salpichroa organifolia*
- 4' Shrubs; corollas salverform, purple *Lycium chinense*
5. Corollas purple, w/ shallow lobes. *Solanum umbelliferum*
- 5' Corollas white, w/ deep lobes *Solanum americanum*

Datura wrightii Regel. Rare. Near railroad tracks. Luzon (AGM 308).

**Lycium chinense* J. S. Miller. Rare. Vineyards. Martinez (CDA 20732). It may have been planted.

**Nicotiana glauca* Graham. Uncommon. Disturbed areas. Crockett; Lake Herman (DGK 04.232); Pacheco Marsh.

**Salpichroa organifolia* (Lam.) Baill. Rare. Old home sites. Benicia (DGK 05.300); Crockett, where it was probably planted.

Solanum americanum Mill. Uncommon. Shaded, wet areas. Edwards Canyon (DGK 04.163); Mount Wanda.

Solanum umbelliferum Eschsch. Uncommon. Appearing as single plants on woodland edges.

Edwards Canyon; Mount Wanda (JOMU 4629); Sky Ranch.

Tamaricaceae

**Tamarix parviflora* DC. Rare. Roadsides. Locally, it is probably persisting from cultivation. Crockett (UC 1607567); Vallejo.

Thymelaeaceae

Dirca occidentalis A. Gray. Rare. Shady woodlands and coastal scrub. CA Rare Plant Rank 1B. Cañada del Cierbo; Edwards Creek, the species' most interior locality (DGK 03.038c).

Ulmaceae

1. Leaves <7 cm; branches rarely winged *Ulmus parvifolia*
- 1' Leaves >7 cm; branches often winged *Ulmus minor*

**Ulmus parvifolia* Jacq. Rare. Persisting as root sprouts from cultivated plants. Martinez.

**Ulmus minor* Mill. [*U. procera* Salisb.]. Rare. Persisting as root sprouts from historic plantings. The English elm is an ancient clone of the field elm (*U. minor*). The Romans used it as a living trellis for vines (Gil et al. 2004). Carquinez Scenic Drive; Ozol Rock (DGK 04.341); Point Pinole (DGK 04.131).

Urticaceae

1. Leaves alternate; stinging hairs absent 2
- 1' Leaves opposite; stinging hairs present 3
2. Leaves <4 mm, orbicular; stems creeping *Soleirolia soleirolii*
- 2' Leaves >10 mm, lanceolate; stems decumbent to erect *Parietaria judaica*
3. Pistillate sepals 2–4; stems dotted w/ black glands *Hesperocnide tenella*
- 3' Pistillate sepals 4; stems w/o black glands (*Urtica*) 4
4. Annuals, 1–6 dm tall; stinging hairs sparse *Urtica urens*
- 4' Perennials, 10–30 dm tall; stinging hairs dense *Urtica dioica* subsp. *holosericea*

Hesperocnide tenella Torr. Uncommon. Shaded banks and rocks. Pinole Creek (JEPS 23520); Cañada del Cierbo (AGM 82); Martinez (AGM 213); Mount Wanda (JOMU 4631); Rankin Park.

**Parietaria judaica* L. Uncommon. Rocks and walls, especially in towns. Crockett (DGK 04.078).

**Soleirolia soleirolii* (Req.) Dandy. Rare. Shaded, moist areas near gardens. Crockett (DGK 05.377).

Urtica dioica L. subsp. *holosericea* (Nutt.) Thorne. Uncommon. In wet soil in sun. Cañada del Cierbo (DGK 04.197); Muir Grave; Rodeo Creek (DGK 04.018).

**Urtica urens* L. Uncommon. Disturbed areas and agricultural fields. Sky Ranch (DGK 04.009).

**Allium neapolitanum* Cirillo. Uncommon. Spreading from garden waste. Crockett (DGK 04.073); Mare Island; Point Pinole (DGK 05.055).

Allium serra McNeal & Ownbey. Rare. Woodlands. Benicia (JEPS 47557); Martinez (UC 13800); Mount Wanda (DGK 04.151).

**Allium triquetrum* L. Rare, Persisting and spreading from garden waste along lightly shaded roads. Ozol (DGK 03.042).

Allium unifolium Kellogg. Rare. Prairies on north-facing slopes. Eckley; upper Rodeo Creek (JEPS 112494).

Amaryllidaceae

**Amaryllis belladonna* L. Rare. Commonly cultivated and persisting from garden waste. Rarely reproducing by seed within planted colonies. Crockett (DGK 11.010); Mount Wanda.

Araceae

- 1. Terrestrial herbs; lvs sagittate; infls large, spathed spikes. *Zantedeschia aethiopica*
- 1' Floating herbs, w/ oval pad-like bodies; infls of few, clustered fls (*Lemna*). 2
- 2. Thallus 1-veined, vein often obscure *Lemna valdiviana*
- 2' Thallus 3–5-veined, veins conspicuous .. *Lemna gibba*

**Zantedeschia aethiopica* (L.) Spreng. Rare. More commonly adventive in wet areas along the coast than here. Local specimens may be persisting from garden waste. Mount Wanda.

Lemna gibba L. Rare. Ponds and ditches. Fernandez Ranch (DGK 07.463); Mare Island (DGK 07.265).

Lemna valdiviana Phil. Rare. Stock ponds. Glen Cove (DGK 05.291); Point Pinole.

Arecaceae

- 1. Lvs pinnate; old lvs falling, leaving bases only. *Phoenix canariensis*
- 1' Lvs palmate; old lvs retained, forming skirt under live lvs *Washingtonia filifera*

**Phoenix canariensis* Chabaud. Uncommon. This plant, the most commonly planted palm in California, is sparingly spontaneous in riparian areas and near the edges of marshes. Martinez Marsh; Pinole Creek (JEPS 96244).

**Washingtonia filifera* (André) de Bary. Rare. Seeding into wetland margins from nearby horticultural plantings. Pacheco Marsh.

Asparagaceae

**Asparagus officinalis* L. subsp. *officinalis*. Uncommon. High salt and brackish marshes; rarely appearing in gardens and disturbed areas spontaneously. Mare Island (AGM 194); Mount Wanda (AGM 115).

Cyperaceae

- 1. Spikelet single, terminal. *Eleocharis macrostachya*
- 1' Spikelets several (rarely single), lateral. 2
- 2. Pistillate fls not surrounded by bladder-like bract 5
- 2' Pistillate fls surrounded by bladder-like bract (perigynium) (*Carex*). 3
- 3. Spikelets >4 cm; lvs dark green. *Carex obnupta*
- 3' Spikelets <2 cm; lvs light green 4
- 4. Pls loosely cespitose; lvs drooping *Carex tumulicola*
- 4' Pls rhizomatous; lvs erect. *Carex praegracilis*
- 5. Spikelets flattened; bracts distichous (*Cyperus*). 6
- 5' Spikelets terete; bracts spiral 8
- 6. Annuals *Cyperus difformis*
- 6' Perennials. 7
- 7. Basal lvs 6–20; spikelets 2–4 mm diam *Cyperus eragrostis*
- 7' Basal lvs 2–6; spikelets ca 2 mm diam *Cyperus involucratus*
- 8. Perennials; spikelets >3 10
- 8' Annuals or short-lived perennials; spikelets 1–3 (*Isolepis*). 9
- 9. Fl bracts keeled above; salt marshes *Isolepis cernua*
- 9' Fl bracts keeled throughout; freshwater marshes *Isolepis carinata*
- 10. Infls subtended by 3–6 bracts. 11
- 10' Infls subtended by 1 bract 13
- 11. Infls lax; spikelets <1 cm long *Scirpus microcarpus*
- 11' Infls gen dense; spikelets >1 cm long (*Bolboschoenus*). 12
- 12. Spikelets tightly clustered, revealing few peduncles; triangular area opposite lf blade w/o veins. *Bolboschoenus maritimus* subsp. *paludosus*
- 12' Spikelets loosely clustered, revealing many peduncles; sheath opposite lf blade w/ veins *Bolboschoenus robustus*
- 13. Stems w/ concave sides *Schoenoplectus americanus*
- 13' Stems w/o concave sides 14
- 14. Stems triangular in cross-section; fr bristles hairy, =fr. *Schoenoplectus californicus*
- 14' Stems terete; fr bristles echinate, <fr. 15
- 15. Spikelets gen clustered. *Schoenoplectus acutus* var. *occidentalis*
- 15' Spikelets gen solitary *Schoenoplectus tabernaemontani*

Bulboschoenus maritimus (L.) Palla subsp. *paludosus* (A. Nelson) T. Koyama [*Scirpus m.* L.]. Locally common. Salt and brackish marshes. Benicia; Lake Herman; Luzon; Mare Island (AGM 170); Martinez (DGK 04.230); Pacheco Marsh (DGK 04.335).

Bulboschoenus robustus (Pursh) Soják [*Scirpus r.* Pursh]. Uncommon. Brackish marshes. Martinez Marsh (DGK 03.104).

Carex obnupta L. H. Bailey. Occasional. Along small streams with moisture available all year. Cummings Skyway; Muir Grave; Vaca Canyon (DGK 04.305).

Carex praegracilis W. Boott. Rare. Forming small to large patches in the west in grasslands

adjacent to salt marshes. Point Pinole (DGK 04.137).

Carex tumulicola Mack. Rare. Grasslands subject to summer fog. Blume Hill (DGK 04.202); Point Pinole.

**Cyperus difformis* L. Rare. Along muddy verges of wetlands. Martinez (DGK 06.474).

Cyperus eragrostis Lam. Common. Wet areas in sun. Cañada del Cierbo (DGK 04.192); Glen Cove (DGK 05.289); Martinez; Muir House (DGK 05.272).

**Cyperus involucratus* Rottb. Rare. Along streams. Crockett. Escaped from cultivation.

Eleocharis macrostachya Britton. Locally common. Freshwater marshes. Franklin Canyon (DGK 05.179); Kite Hill (DGK 05.320); McEwen Road (AGM 250); Point Pinole (DGK 04.140); Vallejo (UC 1100737).

Isolepis cernua (Vahl) Roem. & Schult. [*Scirpus cernuus* Vahl]. Rare. Tidal salt marshes. Glen Cove Shore (DGK 05.298); Martinez (DGK 03.120).

Isolepis carinata Hook & Arn. ex Torr. (*Scirpus koilolepis* [Steud.] Gleason). Rare. Freshwater marshes. Franklin Creek (AGM 252).

Schoenoplectus acutus (Muhl ex Bigelow) Å. Löve & D. Löve. var. *occidentalis* (S. Wats.) S. G. Sm. (*Scirpus a.* Muhl. ex Bigelow var. *occidentalis* [S. Watson] Beetle.). Locally common. Lakes and brackish marshes. Lake Chabot (UC 1100679); Martinez Marsh (DGK 03.106); Vallejo.

Schoenoplectus americanus (Pers.) Schinz & R. Keller [*Scirpus a.* Pers.]. Locally common. Brackish and freshwater marshes. Rarely on the margins of ponds or streams. Beaver Ravine (DGK 05.305); Pacheco Marsh (AGM 323); Vallejo (DGK 04.273).

Schoenoplectus californicus (C. A. Meyer) Soják (*Scirpus c.* [C. A. Mey.] Steud.). Locally common. Brackish and freshwater marshes. Sometimes on the margins of ponds or streams. Glen Cove Shore; Martinez Train Station (DGK 04.229); Vallejo (DGK 04.274).

Schoenoplectus tabernaemontani (C. C. Gmel.) Palla [*Scirpus tabernaemontani* C. C. Gmel.]. Rare (historic). Vallejo (UC 204130, 1903; CAS 104428, 1928).

Scirpus microcarpus J. Presl & C. Presl. Rare. Along perennial streams. Pinole Creek; Vaca Canyon (DGK 04.308).

Iridaceae

1. Perianth of sepals and petals; stigma lobes petaloid *Iris pseudacorus*

1' Perianth of tepals; stigma lobes not petaloid *Sisyrinchium bellum*

**Iris pseudacorus* L. Rare. Brackish marshes. In the Delta, to the east of the study area, this yellow European iris is expanding aggressively. Mare Island (DGK 05.342).

Sisyrinchium bellum S. Watson. Common. Short grasslands. Crockett, 5th Street Prairie; Luzon (AGM 220); Mare Island; Mount Wanda (JOMU 4467); Rodeo Point (DGK 03.078).

Juncaceae

1.	Seeds 3 per fr; lvs grass-like	<i>Luzula comosa</i> var. <i>comosa</i>
1'	Seeds >20 per fr; lvs terete or ensiform (<i>Juncus</i>)	2
2.	Annuals, tufted, <20 cm tall	<i>Juncus bufonius</i> var. <i>bufonius</i>
2'	Perennials, clumping or spreading, >20 cm tall	3
3.	Inflorescences appearing to be lateral on a terete lf	4
3'	Inflorescences a terminal cyme or head; lvs terete or ensiform	7
4.	Pls forming lg colonies; gen saline marshes (rarely freshwater marshes)	5
4'	Pls forming clumps; gen freshwater marshes or grasslands	6
5.	Colonies dense, rhizome internodes <1 cm diam	<i>Juncus gerardii</i> subsp. <i>gerardii</i>
5'	Colonies diffuse, rhizome internodes >3 cm diam	<i>Juncus balticus</i> subsp. <i>ater</i>
6.	Stamens 6; capsules subglobose; lvs bluish; wetlands or grasslands	<i>Juncus patens</i>
6'	Stamens 3; capsules 3-sided; lvs green; wetlands	<i>Juncus effusus</i> subsp. <i>pacificus</i>
7.	Lvs slender, <3 mm diam; pls 20–35 cm tall; uplands	8
7'	Lvs robust, >3 mm diam; pls >40 cm tall; gen wetlands	9
8.	Inflorescences gen lax, cymose; lvs >1/2 length of infl.	<i>Juncus tenuis</i>
8'	Inflorescences dense, capitate; lvs <1/2 length of infl.	<i>Juncus occidentalis</i>
9.	Anthers = or < filaments; tepals green w/ reddish tips, 2–3 mm long; capsules rounded	<i>Juncus xiphiooides</i>
9'	Anthers > filaments; tepals w/ green midribs & dark brown margins, ±4 mm long; capsules tapered	<i>Juncus phaeocephalus</i> var. <i>paniculatus</i>

Juncus balticus Willd. subsp. *ater* (Rydb.) Snogerup (*J. arcticus* Willd. var. *b.* [Willd.] Trautv.). Locally common. Brackish and freshwater marshes. Franklin Canyon (DGK 05.180); Glen Cove (DGK 05.290); Lake Herman (DGK 04.243); Luzon (DGK 05.073); Martinez Marsh (DGK 03.108); Point Pinole (DGK 04.134). *Juncus mexicanus* Willd. (*J. arcticus* var. *m.* [Willd.] Balslev) was reported from Benicia (JEPS 63881, 1911). It should be looked for in freshwater marshes. Northern populations of *J. mexicanus* often lack well-developed leaf blades and are nearly impossible to distinguish from *J. balticus* subsp. *ater*.

Juncus bufonius L. var. *bufonius* Common. Seasonal wetlands of all sizes. Crockett, 5th Street Prairie (DGK 04.060); Mount Wanda (JOMU 4751); Ozol Rock (DGK 04.112);

Point Pinole (DGK 05.051); *Vallejo* (UC 1108879).

Juncus effusus L. subsp. *pacificus* (Fernald & Wiegand) Piper & Beattie. Occasional. Marshy areas and along streams. *Pinole Creek* (AGM 284); *Refugio Valley* (AGM 280).

**Juncus gerardii* Loisel. subsp. *gerardii*. Uncommon (but locally common). Brackish marshes. *Martinez Marsh* (Ertter 18175); *Southhampton Marsh* (CDA 1591).

Juncus occidentalis (Coville) Wiegand. Occasional. Grasslands in the west. *Point Pinole* (DGK 04.144).

Juncus patens E. Mey. Common. In wetlands and in upland prairies. *Cañada del Cierbo* (DGK 04.200); *Mount Wanda* (JOMU 4679); *Muir House*; *Point Pinole* (DGK 05.064b); *Vallejo* (UC 1101093).

Juncus phaeocephalus Engelm. var. *paniculatus* Engelm. Locally common. Wet areas. *Mount Wanda* (JOMU 4473); *Refugio Valley* (AGM 276); *Vallejo* (UC 1101088).

Juncus tenuis Willd. Occasional. Bunchgrass prairies in the west. In the study area, this species is difficult to distinguish from plants recognized as *J. occidentalis*. *Juncus tenuis* has longer leaves (as long as the inflorescence); a diffuse, versus dense, inflorescence; and tepals less than 4 mm. *Crockett*, 5th Street Prairie; *Cummings Skyway* (DGK 03.366); *Luzon* (AGM 224); *Mare Island* (DGK 04.083); *Point Pinole* (DGK 05.050).

Juncus xiphiooides E. Mey. Occasional. Freshwater wetlands. *Cañada del Cierbo* (DGK 04.201); *Lake Herman* (DGK 04.252); *Vaca Canyon* (DGK 04.307).

Luzula comosa E. Mey. var. *comosa*. Occasional. Bunchgrass prairies on north-facing slopes. *Crockett*, 5th Street Prairie (DGK 04.063); *Mount Wanda* (JOMU 4675); *Ozol Rock* (DGK 03.051).

Juncaginaceae

- 1. Frs as wide as long; fls wl 3 fertile and 3 sterile carpels *Triglochin striata*
- 1' Frs longer than wide; fls wl 6 fertile carpels . . . 2
 - 2. Pls >30 cm tall; lf ligules simple *Triglochin maritima*
 - 2' Pls <25 cm; lf ligules 2-parted *Triglochin concinna* var. *concinna*

Triglochin concinna Burtt Davy var. *concinna*. Rare. Tidal salt marshes. *Martinez Marsh*; *Southampton Marsh* (CAS 559289).

Triglochin maritima L. Uncommon. Tidal salt marshes. *Martinez Marsh* (DGK 03.109); *Vallejo* (ND-G 006066).

Triglochin striata Ruiz & Pav. Rare. Tidal brackish marshes. *Martinez Marsh* (DGK 03.116); *Southampton Marsh*.

Liliaceae

- 1. Fls <12 mm; tepals relatively narrow *Prosartes hookeri*

1' Fls >15 mm; tepals relatively broad 2

- 2. Perianth of tepals (*Fritillaria*) 6
- 2' Perianth of sepals and petals (*Calochortus*) . . . 3
 - 3. Corollas yellow 4
 - 3' Corollas white to pink 5
 - 4. Fls erect *Calochortus luteus*
 - 4' Fls pendant *Calochortus pulchellus*
 - 5. Nectaries 1–2 crescents; petals with one spot; dense clay. *Calochortus argillosus*
 - 5' Nectaries square; petals with two spots; well-drained soil. *Calochortus venustus*
 - 6. Tepals maroon (wl yellow spots)
 - 6' Tepals white *Fritillaria liliacea*

Calochortus argillosus (Hoover) Zebell & P. L. Fiedl. Rare. On dense clay slopes. Usually sympatric with *Eryngium jepsonii*. Franklin Ridge; Port Costa Reservoir (DGK 09.364).

Calochortus luteus Douglas ex Lindl. Uncommon. Grasslands in the west. In any one year, only a minority of bulbs in a population produce flowers. In a good year, the showy yellow flowers can appear in places where the plant has been passed unnoticed. *Cañada del Cierbo* (DGK 04.180); *Crockett*, 5th Street Prairie (AGM 77); *Mare Island*; *Pinole Peak*; *Point Pinole*.

Calochortus pulchellus (Benth.) Alph. Wood. Rare. Rocky outcrops on the edge of chaparral. CA Rare Plant Rank 1B. The single, local population at *Ozol Rock* (CAS 49684) is 20 km disjunct from the species' other populations clustered about Mount Diablo.

Calochortus venustus Douglas ex Benth. Rare. Grasslands. *Mount Wanda*.

Fritillaria affinis (Schult. & Schult. f.) Sealy. Rare. Mesic woodlands. *Vaca Canyon* (AGM 262).

Fritillaria liliacea Lindl. Rare (historic). Although this rare bulb occurs both on serpentine and non-serpentine-derived soils, all of its known Carquinez and East Bay localities are or were on non-serpentine-derived soils. CA Rare Plant Rank 1B. *Mare Island* (ND-G 011136, 1874).

Prosartes hookeri Torr. (*Disporum h.* [Torr.] G. Nicholson). Uncommon. Mesic woodlands. Franklin Canyon (AGM 83); *Vaca Canyon*.

Melanthiaceae

- 1. Fls solitary; petals >3 cm *Trillium chloropetalum*
- 1' Fls in panicles; petals <2 cm *Toxicoscordion fremontii*

Toxicoscordion fremontii (Torr.) Rydb. (*Zigadenus f.* [Torr.] Torr. ex S. Watson). Uncommon. Chaparral. *Mount Wanda* (JOMU 4497); *Ozol Rock*.

Trillium chloropetalum (Torr.) Howell. Uncommon. Shady moist canyons. Our local plants

have maroon flowers. McHarry Ranch Road; Pinole Valley; Vaca Canyon.

Orchidaceae

1. Lvs pleated; floral bract lengths = fls *Epipactis helleborine*
- 1' Lvs not pleated; floral bracts lengths < fls (*Piperia*) 2
2. Nectar spurs curved *Piperia elongata*
- 2' Nectar spur ± straight, perpendicular to stem. *Piperia transversa*

**Epipactis helleborine* (L.) Crantz. Rare. Under pines. Our only introduced orchid. Refugio Valley; Pinole Valley (DGK 08.305).

Piperia elongata Rydb. Rare. Nearly bare soil in the west. Crockett, 5th Street Prairie; Selby.

Piperia transversa Suksd. Rare. Nearly bare soil in the west. Occurring with *P. elongata*. Presumably due to similar habitat requirements and the need for the appropriate mycorrhizal fungi, species of *Piperia* often occur together. Crockett, 5th Street Prairie.

Poaceae

1. Stems >1 cm thick, often woody; fl branches >2 m tall 2
- 1' Stems <1 cm thick, not woody; fl branches usually <1.5 m tall 4
2. Lvs mostly basal, spiral; seeps, moist spots, and road cuts *Cortaderia jubata*
- 2' Lvs cauline, distichous; along streams and in marshes 3
3. Stems >3 cm in diam, >3 m tall; lemmas hairy *Arundo donax*
- 3' Stems <2 cm in diam, <3.5 m tall; lemmas glabrous *Phragmites australis*
4. Florets replaced by plantlets (bulbils) *Poa bulbosa* subsp. *vivipara*
- 4' Florets not replaced by plantlets 5
5. Inflo unbranched; spikelets sessile 6
- 5' Inflo w/ 2-many branches; spikelets sessile or peduncled 23
6. Spikelets not hiding infl axis, often <internodes, sessile 7
- 6' Spikelets overlapping, hiding infl axis, >internodes, sessile or short-pedicelled 14
7. Spikelets sunken in infl axis; 1 fertile floret per spikelet; inconspicuous annuals in saline soil 8
- 7' Spikelets not sunken into infl axis; usually >1 fertile floret per spikelet; either not annual or not on saline soil 9
8. Glumes 1 per spikelet; infls usually straight *Hainardia cylindrica*
- 8' Glumes 2 per spikelet; infls usually curved *Parapholis incurva*
9. Spikelets arranged sideways to axis; glumes 2 per spikelet 12
- 9' Spikelets arranged edgewise to infl axis; glumes 1 per spikelet 10
10. Perennials; lemmas awnless *Festuca perennis*²
- 10' Annuals or biennials, lemmas awned 11
11. Awns <6 mm; glumes < lemmas *Festuca perennis*²
- 11' Awns from >6–20 mm; glumes > lemmas *Festuca temulenta*
12. Lemmas awned *Brachypodium distachyon*
- 12' Lemmas not awned 13

13. Pls not rhizomatous; glumes truncate *Elymus ponticus*
- 13' Pls rhizomatous; glumes obtuse *Elymus hispidus*
14. Spikelets one per node 15
- 14' Spikelets 2–3 per node (some may be sterile) 16
15. Spikelets cylindric *Aegilops triuncialis*
- 15' Spikelets compressed *Triticum aestivum*
16. Spikelets 3 per node; lateral spikelets peduncled (*Hordeum*) 17
- 16' Spikelets gen not 3 per node; all spikelets sessile 19
17. Perennials; infls 8–12 × long as wide (not including awns) *Hordeum brachyantherum* subsp. *brachyantherum*
- 17' Annuals; infls 4–7 × long as wide (not including awns) 18
18. Glumes scabrous or glabrous *Hordeum marinum* subsp. *gussoneanum*
- 18' Glumes ciliate *Hordeum murinum* subsp. *leporimum*
19. Annuals; 1 bisexual spikelet per node *Taeniatherium caput-medusae*
- 19' Perennials; >1 bisexual spikelet per node 20
20. Pls rhizomatous; lemmas not awned *Elymus triticoides*
- 20' Pls rhizomatous; lemmas awned 21
21. Spikelets appressed in fr; glumes flat, >1.5 mm diam *Elymus glaucus* subsp. *glaucus*
- 21' Spikelets spreading in fr; glumes terete, <1.5 mm diam 22
22. Inflo ca 6 × longer than wide *Elymus × hansenii*
- 22' Inflo 1–2 × longer than wide *Elymus multisets*
23. Spikelet w/ 1 bisexual floret per spikelet 24
- 23' Spikelets w/ 2 or more bisexual florets per spikelet 61
24. Inflo a dense, foxtail-like panicle; individual branches discrete on close examination 25
- 24' Inflo a lax panicle; individual branches easily seen from a meter away 40
25. Spikelet diarticulating above glumes 26
- 25' Spikelet disarticulating below glumes 32
26. Spikelets not winged 27
- 26' Spikelets winged (*Phalaris*) 29
27. Spikelet not subtended by plumose bristles *Gastridium phleoides*
- 27' Spikelet subtended by plumose bristles (*Pennisetum*) 28
28. Spikelets <7 mm *Pennisetum setaceum*
- 28' Spikelets >8 mm *Pennisetum villosum*
29. Perennials, >80 cm *Phalaris aquatica*
- 29' Annuals, <80 cm 30
30. Fertile spikelet subtended by 4–8 staminate or sterile spikelets *Phalaris paradoxa*
- 30' Spikelets in clusters all bisexual 31
31. Sterile fl 1 per spikelet; glume wings irregularly toothed *Phalaris minor*
- 31' Sterile fls 2 per spikelet; glume wings entire *Phalaris brachystachys*
32. Inflo w/ 2 distinct forms of spikelet 33
- 32' Inflo w/ 1 form of spikelet 34
33. Spikelets in pairs; pedicels not fused at base *Cynosurus echinatus*
- 33' Spikelets in clusters; pedicels fused at base *Lamarckia aurea*
34. Spikelets shed w/o basal stipe 38
- 34' Spikelets shed w/ basal stipe (*Polypogon*) 35

35. Glumes w/o awns *Polypogon viridis*
 35' Glumes wl awns 36
 36. Annuals; glume apices rounded
 Polypogon monspeliensis
 36' Perennials; glume apices acute to truncate 37
 37. Stipes >1.5 mm long; glumes hispidulous
 Polypogon imberbis
 37' Stipes <1.5 mm long, glumes scabrous
 Polypogon interruptus
 38. Infls closely subtended by lvs; glume keels
 scabrous. *Crypsis schoenoides*
 38' Infls not closely subtended by lvs; glume
 keels ciliate. 39
 39. Lemmas awnless *Phleum pratense*
 39' Lemmas awned. *Alopecurus pratensis*
 40. Spikelets wl bisexual floret accompanied
 by staminate or sterile floret(s). 41
 40' Spikelets wl bisexual floret not accompa-
 nied by staminate or sterile floret(s) 49
 41. Reduced floret(s) above bisexual floret 42
 41' Reduced floret(s) below bisexual floret 43
 42. Inflbranches digitately arranged; glumes
 shorter than lemmas *Cynodon dactylon*
 42' Infl not digitately arranged; glumes lon-
 ger than lemmas *Holcus lanatus*
 43. Lemmas indurate (*Sorghum*). 44
 43' Lemmas membranous 45
 44. Clumping annuals *Sorghum bicolor*
 44' Perennials wl rhizomes. *Sorghum halepense*
 45. Infls a pyramidal panicle, upper branches
 shorter than lower branches (*Echinochloa*). 46
 45' Infls digitate or paniculate, all branches
 approximately equal in length 47
 46. Infl branches 1–3 cm long; lemmas not
 awned *Echinochloa colona*
 46' Infl branches 3–7 cm long; lemmas often
 awned *Echinochloa crus-galli*
 47. Infl branches digitately arranged
 Digitaria sanguinalis
 47' Infl branches paniculately arranged or
 paired-dichotomous (*Paspalum*). 48
 48. Infl branches 3–8 *Paspalum dilatatum*
 48' Infl branches 2(–3) *Paspalum distichum*
 49. Glumes absent; spikelets densely imbricate,
 arranged in a line *Leersia oryzoides*
 49' Glumes present; spikelets not or loosely
 imbricate, not arranged in line 50
 50. Upper glume length >1.5 × lower glume. 51
 50' Glumes ± equal in length 53
 51. Sheath apices wl large tuft of hairs
 Sporobolus cryptandrus
 51' Sheath apices glabrous or sparsely pilose
 (*Spartina*). 52
 52. Infl branches closely appressed
 Spartina foliosa
 52' Infl branches widely spreading
 Spartina patens
 53. Lemmas indurate, cylindrical, surrounding
 lemma (*Stipa*). 54
 53' Lemmas membranous, compressed, covering,
 but not surrounding lemma 56
 54. Glumes <11 mm. *Stipa lepida*
 54' Glumes >11 mm. 55
 55. Distal segment of awns straight; lvs green.
 Stipa pulchra
 55' Distal segment of awns wavy; lvs bluish green
 Stipa cernua

56. Lemmas awned from tip
 Stipa miliacea var. *miliacea*
 56' Lemmas awned from back or not awned
 (*Agrostis*). 57
 57. Lemmas puberulent below middle
 Agrostis avenacea
 57' Lemmas glabrous (occ scabrous) 58
 58. Palea length >0.4 × lemma
 Agrostis stolonifera
 58' Palea length <0.4 × lemma, often absent. 59
 59. Lemmas awned; panicles dense; lower
 branches <4 cm long. *Agrostis exarata*
 59' Lemmas not awned; panicles open; lower
 branches >3 cm long. 60
 60. Anthers 1.5–2.3 mm long; callus hairs
 abundant, 0.5–2.0 mm. *Agrostis hallii*
 60' Anthers 0.7–1.8 mm long; callus hairs
 absent or sparse, ca 0.3 mm. *Agrostis pallens*
 61. Spikelets wl 2 or more sterile florets below
 fertile floret *Elhrharta erecta*
 61' Spikelets w/o sterile florets below fertile floret. 62
 62. Lower glumes >lowest florets 63
 62' Lower glumes <or=lower florets 70
 63. Lemmas awned from near middle or below 64
 63' Lemmas awned from or near tip 69
 64. Lemma awns gen <12 mm; spikelets >20
 per infl. 66
 64' Lemma awns 12–20 mm; spikelets gen
 <15 per infl (*Avena*). 65
 65. Fork at lemma tip >2 mm. *Avena barbata*
 65' Fork at lemma tip <1 mm. *Avena fatua*
 66. Lemma 1–2 mm; spikelet axes not
 prolonged beyond terminal floret
 Aira caryophyllea
 66' Lemma 2–4 mm; spikelet axes prolonged
 beyond terminal floret (*Deschampsia*). 67
 67. Annuals *Deschampsia danthonioides*
 67' Perennials. 68
 68. Pl tufts < 10 cm; lvs <1 mm diam; infls
 <1.5 cm diam. *Deschampsia elongata*
 68' Pl tufts >20 cm; lvs >1 mm diam; infls
 >2 cm diam
 Deschampsia cespitosa subsp. *holciformis*
 69. Spikelet axes glabrous; spikelets >5 mm diam
 *Danthonia californica*
 69' Spikelet axes hairy; spikelets < 4 mm diam . . .
 Trisetum canescens
 70. Upper glumes wider than lower glumes.
 Koeleria macrantha
 70' Glumes ± equal 71
 71. Glumes papery; lemmas clearly 5–7 veined
 (*Melica*). 72
 71' Glumes not papery; lemmas not clearly veined. 73
 72. Spikelet gen <6 mm, wl 1–2 fertile
 florets *Melica californica*
 72' Spikelets gen >7 mm, wl 3–7 fertile
 florets *Melica torreyana*
 73. Infls dense, gen <3 × longer than wide; spikelets
 clustered on one side of branches.
 Dactylis glomerata
 73' Infls gen lax, >3 × longer than wide; spikelets
 not clustered on one side of branches. 74
 74. Lemmas awned. 75
 74' Lemmas awnless 90
 75. Lemmas awned from bifid tips; lf sheaths
 closed (*Bromus*). 76
 75' Lemmas awned from tips or awns lacking; lf
 sheaths open (*Festuca*). 84

76. Glumes and lemmas clearly keeled 77
 76' Lemmas slightly compressed to rounded, not clearly keeled 78
 77. Lower infl branches wide-spreading; membranous lemma margin gen <1 mm.
 *Bromus carinatus* var. *carinatus*
 77' Lower infl branches ascending-spreading; membranous lemma margin gen >1 mm.
 *Bromus catharticus* var. *elatus*
 78. Lemma awns >15 mm; lemma teeth 3–7 mm (exc. *B. sterilis*) 79
 78' Lemma awns <15 mm; lemma teeth 0–3 mm 83
 79. Lemma awns bent, gen twisted.
 *Bromus berteroanus*
 79' Lemma awns gen straight 80
 80. Inflorescences relatively dense, branches all ascending; spikelets gen > lower branches. 81
 80' Inflorescences open, lower branches spreading; spikelets < lower branches. 82
 81. Inflorescences somewhat loose, oblong-ovoid, many branches easily visible; lemmas > 3 mm diam. *Bromus madritensis* subsp. *madritensis*
 81' Inflorescences dense, ovoid, few, if any, branches visible; lemmas gen < 3 mm diam.
 *Bromus madritensis* subsp. *rubens*
 82. Lemma bodies 18–30 mm; awns 30–50 mm
 *Bromus diandrus*
 82' Lemma bodies 9–15 mm; awns 8–30 mm
 *Bromus sterilis*
 83. Perennials; inflorescences loose *Bromus laevipes*
 83' Annuals; inflorescences dense. *Bromus hordeaceus*
 84. Perennials; stamens 3. 85
 84' Annuals; stamens gen 1 88
 85. Lvs <3 mm diam; basal lobes of lf blades lacking or not clasping stem. 86
 85' Lvs >3 mm diam; basal lobes of lf blades prominent 87
 86. Lf sheath closed, hairy. *Festuca rubra*
 86' Lf sheath 1/2 open, glabrous. *Festuca idahoensis*
 87. Basal lf lobes hairy; lemma awns 0.5–1.5 mm or lacking. *Festuca arundinacea*
 87' Basal lobes glabrous; lemma awns 0–0.3 mm
 *Festuca pratensis*
 88. Lower glumes >1/2 length of upper glumes. 89
 88' Lower glumes <1/2 length of upper glumes. *Festuca myuros*
 89. Lower infl branches appressed to ascending.
 *Festuca bromoides*
 89' Lower infl branches spreading or reflexed.
 *Festuca microstachys*
 90. Lemmas wider than long (*Briza*). 91
 90' Lemmas longer than wide 92
 91. Spikelets >7 mm long *Briza maxima*
 91' Spikelets <5 mm long *Briza minor*
 92. Spikelets unisexual; inflorescences shorter than vegetative stem *Distichlis spicata*
 92' Spikelets bisexual; inflorescences gen longer than vegetative stem 93
 93. Inflorescences a series of ± equal spikes, mostly digitately arranged *Eleusine indica*
 93' Inflorescences w/ branches not equal in length, paniculate. 94
 94. Panicle raceme-like (w/ short side branches bearing single spikelets).
 *Pleuropogon californicus* var. *californicus*
 94' Inflorescences a typical panicle (some side branches longer than spikelets). 95
 95. Lemma veins not converging at tips; lf tips flat
 *Glyceria declinata*
 95' Lemma veins converging at tips; lf tips folded, prow-like (*Poa*) 96
 96. Annuals 97
 96' Perennials 98
 97. Culms to 2 dm tall; sheaths smooth. *Poa annua*
 97' Culms gen >2 dm tall; sheaths retroflexely roughened *Poa howellii*
 98. Rhizomes present.
 *Poa pratensis* subsp. *pratensis*
 98' Rhizomes absent.
 *Poa secunda* subsp. *secunda*

**Aegilops triuncialis* L. Rare. Disturbed grasslands. Lake Herman (DGK 04.250).

**Agrostis avenacea* J. F. Gmel. (*Lachnagrostis filiformis* [G. Forst.] Trin.). Rare. Wet mud. Lake Herman (DGK 04.257); Point Pinole (DGK 06.505).

Agrostis exarata Trin. Rare. Marshes. Martinez Marsh (DGK 03.113).

Agrostis hallii Vasey. Rare. Grasslands. Pinole Peak (AGM 277).

Agrostis pallens Trin. Common. North slopes in grasslands or in light shade of oaks. Beaver Ravine (DGK 05.314); Crockett (DGK 00.144); Eckley (DGK 04.213); Kite Hill (DGK 05.322); Mount Wanda (DGK 04.157); Selby.

**Agrostis stolonifera* L. Common. Along streams and in wet areas. Glen Cove Shore; Mare Island (AGM 107); Muir House.

**Aira caryophyllea* L. Pervasive. Grasslands. Cañada del Cierbo (DGK 04.190); Crockett, 5th Street Prairie (DGK 04.059); Eckley; Mare Island; Mount Wanda (JOMU 4523).

**Alopecurus pratensis* L. Rare. Rough lawns. Vallejo (DGK 05.112).

**Arundo donax* L. Common. Along perennial streams. Martinez; Muir Grave; Muir House.

**Avena barbata* Pott ex Link. Pervasive. Grasslands, where it is often dominant. Rodeo Creek (DGK 05.143); Mount Wanda; Muir Grave.

**Avena fatua* L. Common. Grasslands. Carquinez Scenic Drive (UCD 38559); Mount Wanda (JOMU 4533); Muir Grave; Muir House; Selby.

**Brachypodium distachyon* (L.) P. Beauv. Uncommon. Grazed grasslands and on banks. Ozol Rock (DGK 07.433).

**Briza maxima* L. Rare. Grasslands. Point Pinole (DGK 04.139).

**Briza minor* L. Occasional. Grasslands, especially in the west. Cañada del Cierbo (DGK 04.104); Luzon (AGM 219); Mount Wanda (JOMU 4521); Vallejo (JEPs 72967).

**Bromus berteroanus* Colla. [*B. trinii* Desv. var. *t.*]. Rare. Grassy banks. Martinez (UCD 38557).

**Bromus catharticus* Vahl var. *elatus* (E. Desv.) Planchuelo. Common. Disturbed, lightly shaded areas in the west. Crockett (DGK 05.395); Glen Cove Shore (DGK 05.296); Ozol Rock;

Point Pinole (DGK 05.063); Vallejo (DGK 05.114).

Bromus carinatus Hook. & Arn. var. *carinatus*. Common. Bunchgrass prairies. Beaver Ravine (DGK 05.315); Cañada del Cierbo (DGK 04.101); Crockett (DGK 05.193); Eckley (DGK 05.193); Mount Wanda; Pinole Peak; Point Pinole.

**Bromus diandrus* Roth. Pervasive. Grasslands and in disturbed areas. Carquinez Scenic Drive; Crockett (DGK 06.162); Mare Island; Mount Wanda (JOMU 4729); Muir Grave; Muir House; Ozol Rock.

**Bromus hordeaceus* L. Pervasive. Bunchgrass prairies and other grasslands. Cummings Skyway (DGK 03.363); Edwards Canyon (DGK 04.165); Mare Island; Martinez (UCD 38558); Mount Wanda (JOMU 4529); Ozol Rock (DGK 03.063); Rodeo Creek (UC 677567).

Bromus laevipes Shear. Occasional. Lightly shaded woodlands. Cummings Skyway (DGK 03.365); Edwards Canyon (DGK 04.173); Ozol Rock; Vaca Canyon (AGM 239).

**Bromus madritensis* L. subsp. *madritensis*. Common. Disturbed areas along roads. Beaver Ravine; Carquinez Scenic Drive (UCD 58960); Mount Wanda (JOMU 4511); Ozol (DGK 03.065).

**Bromus madritensis* L. subsp. *rubens* (L.) Husn. Common. Disturbed areas and dry soil. Alhambra Valley Road (JEPS 75534); Crockett, 5th Street Prairie (DGK 08.088); Mount Wanda; Ozol Rock.

**Bromus sterilis* L. Rare. Grasslands. Pinole Valley (DGK 09.290).

**Cortaderia jubata* (Lem.) Stapf. Uncommon. Hillside seeps and creek banks. Crockett; Mare Island (AGM 163).

**Crypsis schoenoides* (L.) Lam. Rare. Drying mud in seasonally inundated areas. Lake Herman (DGK 04.234); Mount Wanda (JOMU 4739).

**Cynodon dactylon* (L.) Pers. Common. Gardens, but occasionally found in disturbed areas. Carquinez Scenic Drive (DGK 04.208); Mount Wanda (JOMU 4736); Muir Grave; Muir House.

**Cynosurus echinatus* L. Common. Grasslands in the east, especially in low-nutrient soils. Mare Island (DGK 04.089); Mount Wanda (JOMU 4731); Muir Grave.

**Dactylis glomerata* L. Uncommon. Disturbed, mesic areas. Glen Cove Shore (DGK 05.304); Mount Wanda (JOMU 4535).

Danthonia californica Bol. Uncommon. Bunchgrass prairies in the west. Crockett, 5th Street Prairie; Fernandez Ranch (DGK 05.095); Mare Island; Point Pinole (DGK 04.147); Selby (DGK 02.020).

Deschampsia cespitosa (L.) P. Beauv. subsp. *holciformis* (J. Presl) W. E. Lawr. Uncommon. Brackish marshes. Benicia (UCD 35833); Martinez (UC 60233, 1900); Pacheco Marsh (DGK s.n.); Southampton Marsh.

Deschampsia danthonioides (Trin.) Munro. Rare. Grazed grasslands. One of the few native, annual grasses in our area. Fernandez Ranch (DGK 05.095).

Deschampsia elongata (Hook.) Munro. Rare. Brushy slopes. Ozol Rock (DGK 05.268); Point Pinole (DGK 06.205b).

**Digitaria sanguinalis* (L.) Scop. Rare. Coarse lawns and channels. Crockett (DGK 05.390); Pinole Creek (DGK 06.469).

Distichlis spicata (L.) Greene. Common. Salt and brackish marshes. Mare Island (AGM 192); Martinez; Pacheco Marsh (DGK 04.338b); Point Pinole (DGK 04.133).

**Echinochloa colona* (L.) Link. Rare. Wet soil in sun. Rodeo Creek (DGK 03.121).

**Echinochloa crus-galli* (L.) P. Beauv. Occasional. Edges of wetlands. Lake Herman (DGK 04.263); Martinez Marsh (DGK 03.121).

**Ehrharta erecta* Lam. Occasional. Shade of oaks and eucalyptus. Crockett; Eckley (DGK 04.216).

**Eleusine indica* (L.) Gaertn. Rare. Rough lawns. Crockett (DGK 04.292).

**Elymus caput-medusae* L. (*Taeniatherum c.* [L.] Nevski). Rare. Disturbed grasslands. Lake Herman (DGK 04.251).

Elymus glaucus Buckley subsp. *glaucus*. Common. North-facing grassy slopes and openings in scrub. Benicia Carquinez Scenic Drive; Crockett, 5th Street Prairie (DGK 02.017); Mount Wanda (JOMU 4537); Point Pinole.

Elymus × hansenii Scribn. Uncommon. Grasslands. The hybrid between *E. glaucus* and *E. multisetus* occurs where both parents grow. Beaver Ravine (DGK 05.312); Crockett, 5th Street Prairie (DGK 05.384); Eckley; Franklin Canyon (DGK 07.290).

**Elymus hispidus* (Opiz) Melderis. (*Elytrigia intermedia* [Host] Nevski subsp. *i.*; *Thinopyrum intermedium* [Host] Barkworth & D. R. Dewey). Rare. Along railroad tracks. Crockett.

Elymus multisetus (J. G. Sm.) Burtt Davy. Uncommon. Grassy hills. Crockett (DGK 02.018); Eckley; Franklin Canyon; Kite Hill (DGK 05.320); McEwen Road (DGK 07.291).

**Elymus ponticus* (Podp.) N. Snow. (*Elytrigia pontica* [Podp.] Holub; *Thinopyrum ponticum* [Podp.] Barkworth & D. R. Dewey). Rare. Waste areas adjacent to salt marshes. Mare Island (AGM 174).

Elymus triticoides Buckley. Pervasive. The typical form of this species is less than 80 cm high and green; it grows along streams. The most common form keying to this species in the study area is taller and has glaucous leaves; it

grows on hillsides. Cañada del Cierbo (DGK 04.196); Crockett, 5th Street Prairie (DGK 05.385); Luzon (AGM 297); Mare Island (DGK 05.346); Mount Wanda (JOMU 4741); Muir Grave; Ozol Rock (DGK 04.283).

**Festuca arundinacea* Schreb. (*Schedonorus arundinaceus* [Schreb.] Dumort.). Occasional. Disturbed areas in the west. Cañada del Cierbo; Glen Cove Shore (DGK 05.294); Martinez (DGK 05.233); Point Pinole (DGK 04.142); Vallejo (DGK 04.271).

**Festuca bromoides* L. (*Vulpia b.* [L.] Gray). Rare. Disturbed grasslands. Point Wanda.

Festuca idahoensis Elmer. Uncommon. Lightly grazed/ungrazed grasslands on steep slopes. Beaver Ravine (DGK 05.313); Eckley (DGK 04.064); Kite Hill (DGK 05.321); McEwen Road; Pinole Peak (AGM 269).

Festuca microstachys Nutt. (*Vulpia m.* [Nutt.] Munro var. *ciliata* [Beal] Lonard & Gould; *V. m.* var. *pauciflora* [Beal] Lonard & Gould). Rare. Grasslands on thin soil. Carquinez Scenic Drive (UCD 36926); Ozol Rock (DGK 05.256).

**Festuca myuros* L. (*Vulpia m.* [L.] C. C. Gmel.; *V. m.* var. *hirsuta* Hack.). Pervasive. Banks and disturbed soil. Blume Hill (DGK 05.072); Cañada del Cierbo (DGK 04.191); Cummings Skyway (DGK 03.351); Martinez; Mount Wanda (DGK 05.036); Rodeo Shore (DGK 03.079).

**Festuca perennis* (L.) Columbus & J. P. Sm. [*Lolium perenne* L.; *L. multiflorum* Lam.]. Pervasive. Grasslands, particularly in disturbed and high-nutrient soils. Eckley (DGK 04.069); Franklin Canyon (UC 769868); Glen Cove Shore (DGK 05.295); Mount Wanda (JOMU 4531); Muir Grave; Muir House.

**Festuca pratensis* Huds. (*Schedonorus p.* [Huds.] P. Beauv.). Rare. Along streams. Cañada del Cierbo (DGK 04.195).

Festuca rubra L. Rare. Margins of brackish, tidal channels. Southampton Marsh (DGK 05.458).

**Festuca temulenta* (L.) Columbus & J. P. Sm. [*Lolium temulentum* L.] Rare. Grasslands in the east. Martinez.

**Gastridium phleoides* (Nees & Meyen) C. E. Hubb. Occasional. Grasslands on thin soils. Mount Wanda (JOMU 4519); Muir Grave; Ozol Rock (DGK 05.282).

**Glyceria declinata* Bréb. Rare. Freshwater marshes. Often misidentified as *G. × occidentalis* (Piper) J. C. Nelson, a native perennial with longer leaves and panicle branches. Our local form of *G. declinata* seems to be annual. McEwen Road (AGM 248).

**Hainardia cylindrica* (Willd.) Greuter. Rare. Edges of salt pans. Pinole Creek (UC 50509).

**Holcus lanatus* L. Currently uncommon. Coastal prairies along streams. Crockett (DGK 05.386).

Hordeum brachyantherum Nevski subsp. *brachyantherum*. Occasional. Vernally wet areas in sun. Cañada del Cierbo (DGK 04.105); Cummings Skyway (DGK 03.093); Giant Marsh (CAS 526522); Mount Wanda (JOMU 4539); Ozol Rock (DGK 03.093); Point Pinole (DGK 05.061).

**Hordeum marinum* Huds. subsp. *gussoneanum* (Parl.) Thell. Pervasive. Grasslands that are moist in spring. Cañada del Cierbo (DGK 04.100); Franklin Canyon (DGK 05.170); Mare Island; Mount Wanda (JOMU 4541); Muir House; Ozol Rock (DGK 09.301).

**Hordeum murinum* L. subsp. *leporinum* (Link) Arcang. Pervasive. Grasslands. Mare Island; Mount Wanda (JOMU 4513); Muir Grave; Muir House; Rodeo Point (DGK 03.081).

Koeleria macrantha (Ledeb.) Schult. Uncommon. Edges of prairies. Benicia (JEPS 76070); Eckley (DGK 04.122); Kite Hill (DGK 05.323); Pinole Peak (AGM 266b).

**Lamarckia aurea* (L.) Moench. Rare. Grasslands. Mount Wanda (JOMU 4549).

Leersia oryzoides (L.) Sw. Rare. Wet ditches. Bull Valley (DGK 07.656).

Melica californica Scribn. Uncommon. Steep slopes and roadcuts. Beaver Ravine (DGK 05.310); Benicia (JEPS 76071); Eckley; Mount Wanda (JOMU 4543); Ozol Rock (DGK 04.115); Vallejo (DGK 05.122).

Melica torreyana Scribn. Common. Dry shade under oaks. Crockett, 5th Street Prairie (DGK 04.058); Eckley; Edwards Canyon (DGK 04.066b); Mount Wanda (JOMU 4525); Ozol Rock (DGK 03.055).

**Parapholis incurva* (L.) C. E. Hubb. Uncommon. Saline soil, often at the edges of salt scalds. Martinez (UC 50508); Pacheco Marsh; Point Pinole (DGK 04.143).

**Paspalum dilatatum* Poir. Uncommon. Wet, sunny areas. Martinez (AGM 317); Mount Wanda (JOMU 4770).

Paspalum distichum L. Rare. Pond edges. Alhambra Valley (DGK 10.443); Lake Herman (DGK 04.246).

**Pennisetum setaceum* (Forsskål) Chiov. Rare. Waif on roadsides. Vallejo (DGK 07.464). Although a noxious weed in southern California, *P. setaceum* has not yet proved invasive in the Bay Area. Small populations may persist for decades, but do not spread.

**Pennisetum villosum* Fresen. Rare. Along railroad tracks. Pinole Shore (UC 1618363).

**Phalaris aquatica* L. Common. Ungrazed grasslands, especially along the northern section of the strait. Luzon (AGM 296); Mare Island (AGM 99); Mount Wanda (JOMU 4555); Refugio Valley (AGM 266a).

**Phalaris brachystachys* Link. Rare (historic). Pinole Valley (UC 50715, 1900).

**Phalaris minor* G. Retz. Rare. Disturbed areas. Franklin Canyon (UC 768492).

**Phalaris paradoxa* L. Uncommon. Disturbed areas. Lake Herman (DGK 04.248); Mount Wanda; Rodeo Creek (DGK 05.154).

**Phleum pratense* L. Rare. Lawns. Point Pinole (DGK 04.146).

Phragmites australis (Cav.) Trin. ex Steud. Locally common. Brackish marshes in the east. Benicia (UC 70791); Martinez Marsh (DGK 03.101); Pacheco Marsh.

Pleuropogon californicus (Nees) Benth. ex Vasey var. *californicus*. Rare. Seasonal wetlands. Franklin Canyon (CAS 175863, 1929); Martinez (UC 1112203, 1956).

**Poa annua* L. Pervasive. Gardens and disturbed areas. Edwards Canyon; Mount Wanda (JOMU 4547); Muir House; Muir Grave.

**Poa bulbosa* L. subsp. *vivipara* (Koeler) Arcang. Rare. Along small streams. Vallejo (DGK 04.270).

Poa howellii Vasey & Scribn. Rare. North-facing, mesic slopes, where it is easily overlooked. Cañada del Cierbo (DGK 06.127); Vaca Canyon.

**Poa pratensis* L. subsp. *pratensis*. Rare. Wet areas along streams. Vallejo (DGK 05.113).

Poa secunda J. Presl subsp. *secunda*. Uncommon. Steep slopes and on thin soils in grasslands and chaparral. The one-sided bluegrass is extremely widespread and variable in the western United States. Our local form grows in bunches <5 cm diam. and seems to be short-lived. Benicia Hills (JEPS 76069); Fernandez Ranch (DGK 05.087); Mount Wanda; Ozol Rock (DGK 03.060); Rodeo Creek (DGK 05.132); Vaca Canyon (AGM 255).

**Polypogon imberbis* (Phil.) Johow. [*P. elongatus* Kunth]. Rare (historic). Martinez (UC 33886, 1900).

**Polypogon interruptus* Kunth. Rare. Wet areas. Refugio Valley (AGM 279).

**Polypogon monspeliensis* (L.) Desf. Common. Puddles, sandbars, and other wet, disturbed areas. Mare Island; Martinez (UC 50634); Mount Wanda (JOMU 4746); Muir Grave; Muir House; Point Pinole (DGK 04.135).

**Polypogon viridis* (Gouan) Breistr. Uncommon. Wet areas. Christie; Mare Island.

**Sorghum bicolor* (L.) Moench. Rare. Along streams. Pinole Creek (UC 1618378).

**Sorghum halepense* (L.) Pers. Uncommon. Disturbed roadsides and waste areas. Crockett (DGK 04.209); Rodeo Point (AGM 199).

Spartina foliosa Trin. Uncommon. Tidal marshes growing below the high-tide line. Mare Island (AGM 178); Rodeo Shore (DGK 04.314).

**Spartina patens* (Aiton) Muhl. Rare. Tidal marshes. Southampton Marsh (DGK 03.150).

Sporobolus cryptandrus (Torr.) A. Gray. Rare. Vallejo (SBBG 116094).

Stipa cernua Stebbins & Love (*Nassella c.* [Stebbins & Love] Barkworth). Rare. Rocky outcrops. Above Crockett, 5th Street Prairie (DGK 09.315).

Stipa lepida Hitchc. (*Nassella l.* [Hitchc.] Barkworth). Occasional. Bunchgrass prairies and on the edges of coastal scrub. Although it occasionally grows with its congener, *S. pulchra*, *S. lepida* seems less tolerant of hot, dry conditions. Eckley (DGK 04.068); Edwards Canyon (DGK 05.197); Mount Wanda (JOMU 4732); Ozol Rock.

**Stipa miliacea* (L.) Hoover var. *miliacea*. (*Piptatherum m.* [L.] Coss. subsp. *m.*). Common. High marshes and along streams in disturbed, sunny areas. Crockett; Mare Island; Martinez (AGM 316).

Stipa pulchra Hitchc. (*Nassella p.* [Hitchc.] Barkworth). Common. Thin soils, ridgetops, and on south-facing slopes in grasslands. Crockett, 5th Street Prairie (DGK 02.021); Cummings Skyway (DGK 03.368); Fernandez Ranch (DGK 02.021); Mount Wanda (JOMU 4726); Muir House; Point Pinole (DGK 05.054).

Trisetum canescens Buckley. Uncommon. Shaded, mesic slopes. Carquinez Scenic Drive (UCD 36927); Ozol Rock (DGK 05.252); Vaca Canyon (DGK 04.287).

**Triticum aestivum* L. Uncommon. Persisting for some years after seeding for soil stabilization. Crockett (DGK 05.043); Mount Wanda (JOMU 4545); Muir Grave; Vallejo (DGK 04.278).

Pontederiaceae

**Pontederia cordata* L. Rare. Emergent in streams, probably established from garden waste. Rodeo Creek.

Potamogetonaceae

1. Submersed linear lvs and elliptic floating lvs both present *Potamogeton nodosus*
- 1' Submersed linear lvs only present 2
 2. Lvs >5 mm diam, margins undulate *Potamogeton crispus*
 - 2' Lvs < 2 mm diam, margins flat *Stuckenia pectinata*

**Potamogeton crispus* L. Rare. Ponds and lakes. Lake Herman (DGK 04.232).

Potamogeton nodosus Poir. Rare. Ponds and lakes. Lake Herman (UC 1100070).

Stuckenia pectinata (L.) Börner [*Potamogeton pectinatus* L.]. Uncommon. Ponds and stagnant ditches. Crockett (DGK 06.471); Lake Herman (DGK 04.249); Vallejo (DGK 04.232).

Ruppiaceae

Ruppia maritima L. Uncommon. Ponds and salty sloughs. Giant Marsh; Mare Island (DGK 05.355); Point Pinole (DGK 04.138); Vallejo (UC 1100024).

Ruscaceae

1. Fls in panicles; pls clumping *Maianthemum racemosum*
- 1' Fls in racemes; pls spreading via rhizomes *Maianthemum stellatum*

Maianthemum racemosum (L.) Link (*Smilacina racemosa* [L.] Desf.). Uncommon. Moist, shady canyons. Often occurring with *M. stellatum*. Franklin Canyon; Vaca Canyon (AGM 245).

Maianthemum stellatum (L.) Link (*Smilacina stellata* [L.] Desf.). Uncommon. Moist, shady canyons. Often occurring with *M. racemosum*. Edward's Canyon; Franklin Canyon; Vaca Canyon.

Themidaceae

1. Inflorescences lax; fls long-pedunculate 2
- 1' Inflorescences dense; fls sessile or short-pedunculate (*Dichelostemma*) 4
2. Stamens 6 . . . *Brodiaea elegans* subsp. *elegans*
- 2' Stamens 3 (plus 3 staminodes) (*Triteleia*) 3
3. Corollas purple, funneliform *Triteleia laxa*
- 3' Corollas white, campanulate *Triteleia hyacinthina*
4. Fertile stamens 6; fls not narrowed above ovaries *Dichelostemma congestum*
- 4' Fertile stamens 3; fls narrowed above ovaries *Dichelostemma capitatum* subsp. *capitatum*

Brodiaea elegans Hoover subsp. *elegans*. Common. Grasslands. Cañada del Cierbo (AGM 83); Mare Island; Martinez (DGK 05.240); Mount Wanda (JOMU 4488); Pinole Peak.

Dichelostemma capitatum (Benth.) A. W. Wood subsp. *capitatum*. Pervasive. Grasslands. Alhambra Valley (UC 1300933); Martinez (UC 64062); Mount Wanda (JOMU 4491); Port Costa (UC 72521); Point Pinole.

Dichelostemma congestum (Sm.) Kunth. Common. Grasslands. Usually a little later in flowering than *D. capitatum*, the round-tooth ookow has flowers of a paler shade. Cañada del Cierbo (DGK 04.182); Eckley (DGK 04.071); Franklin Canyon (DGK 05.171); Mount Wanda (JOMU 4477).

Triteleia hyacinthina (Lindl.) Greene. Uncommon. Vernally moist grasslands. One local population (Kite Hill, Benicia) is on a well-drained hillside. Point Pinole (JEPS 112499); Luzon (JEPS 112493); Kite Hill (JEPS 112490); Vallejo.

Triteleia laxa Benth. Common. Grasslands. Beaver Ravine (DGK 05.308); Carquinez Scenic Drive (DGK 04.066); Edwards Canyon (DGK 04.066); Mare Island; Martinez (UC 3318); Mount Wanda.

Typhaceae

1. Staminate and pistillate sections of infls confluent; compound pedicels in pistillate spikes smooth *Typha latifolia*

- 1' Staminate and pistillate sections of infls separate; compound pedicels in pistillate spikes papillate 2
2. Pistillate spikes light brown; bracts apiculate *Typha domingensis*
- 2' Pistillate spikes dark brown; bracts blunt *Typha angustifolia*

Typha angustifolia L. Locally common. Marshes and ponds. Crockett; Luzon (AGM 298); Martinez Marsh (DGK 03.105).

Typha domingensis Pers. Rare. Brackish marshes. Crockett (UC 1241770).

Typha latifolia L. Locally common. Marshes, ponds, and seeps. Mare Island (AGM 196); Point Pinole; Refugio Valley (AGM 281).

Zannichelliaceae

Zannichellia palustris L. Rare. Stock ponds. Fernandez Ranch (DGK 07.631).

Zosteraceae

Zostera marina L. Rare. Sandy or muddy underwater flats in salt water. Point Pinole (UC 1719619); Rodeo Shore (DGK 04.315).

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APPENDIX 1

GEOGRAPHIC COORDINATES OF COMMON COLLECTION LOCALITIES IN THE STUDY AREA REGION

Number	Locality	Coordinates
1	Alhambra Valley	37°57'47"N, 122°11'48"W
2	Arroyo del Hambre	37°58'42"N, 122°07'18"W
3	Beaver Ravine	38°04'54"N, 122°09'48"W
4	Benicia	38°03'15"N, 122°09'07"W
5	Benicia Junction	38°02'58"N, 122°07'41"W
6	Blume Hill	37°58'47"N, 122°19'16"W
7	Bull Valley	38°03'12"N, 122°12'15"W
8	Cañada del Cierbo	38°02'32"N, 122°14'22"W
9	Christie	37°59'12"N, 122°11'05"W
10	Carquinez Scenic Drive	38°01'47"N, 122°10'17"W
11	Crockett	38°03'09"N, 122°12'47"W
12	Crockett, Crolona Heights	38°03'16"N, 122°13'07"W
13	Crockett, 5th Street Prairie	38°02'55"N, 122°13'33"W
14	Cummings Skyway	38°02'33"N, 122°13'25"W
15	Eckley	38°03'11"N, 122°11'58"W
16	Edwards Canyon	38°02'17"N, 122°12'50"W
17	Elkhorn Creek	38°03'14"N, 122°12'27"W
18	Fernandez Ranch	37°59'31"N, 122°12'35"W
19	Ferndale Road	37°58'30"N, 122°10'55"W
20	Franklin Canyon	37°59'57"N, 122°09'52"W
21	Franklin Hills	37°59'24"N, 122°08'11"W
22	Giant Marsh	37°59'21"N, 122°21'26"W
23	Glen Cove Pond	38°04'17"N, 122°12'44"W
24	Glen Cove Shore	38°04'02"N, 122°12'15"W
25	Glen Frazer	38°00'24"N, 122°10'07"W
26	Hercules	38°01'45"N, 122°15'21"W
27	Kite Hill	38°06'00"N, 122°10'52"W
28	Lake Herman	38°05'35"N, 122°09'30"W
29	Lone Tree Point	38°02'12"N, 122°16'29"W
30	Luzon	38°00'59"N, 122°15'01"W
31	Mare Island	38°04'29"N, 122°15'26"W
32	Martinez Marsh	38°01'30"N, 122°08'28"W
33	Martinez Train Station	38°01'08"N, 122°08'22"W
34	McEwen Road	38°01'07"N, 122°10'42"W
35	McHarry Ranch Road	37°59'54"N, 122°10'19"W
36	Mount Wanda	37°59'08"N, 122°07'53"W
37	Muir Grave	37°58'43"N, 122°07'25"W
38	Muir House	37°59'29"N, 122°07'54"W
39	Ozol Rock	38°01'29"N, 122°09'30"W
40	Pacheco Marsh/Slough	38°01'45"N, 122°05'23"W
41	Pig Sale	37°57'47"N, 122°10'31"W
42	Pinole	38°00'06"N, 122°17'38"W
43	Pinole Creek	37°58'17"N, 122°14'15"W
44	Pinole Peak	37°59'42"N, 122°13'07"W
45	Pinole Valley	37°59'08"N, 122°14'48"W
46	Point Pinole	38°00'30"N, 122°21'37"W
47	Port Costa	38°02'45"N, 122°10'58"W
48	Port Costa Reservoir	38°02'33"N, 122°11'25"W
49	Rankin Park	38°00'52"N, 122°08'48"W
50	Refugio Valley	37°59'38"N, 122°14'05"W
51	Rodeo Creek	38°01'23"N, 122°12'45"W
52	Rodeo Shore	38°02'26"N, 122°15'50"W
53	Selby	38°03'20"N, 122°14'01"W
54	Sky Ranch	37°59'08"N, 122°09'50"W
55	Southampton Marsh	38°04'15"N, 122°11'19"W
56	Tormey Headlands	38°03'05"N, 122°14'45"W
57	Vaca Canyon	37°58'13"N, 122°09'45"W
58	Vallejo	38°06'23"N, 122°15'15"W
59	Vine Hill	38°00'53"N, 122°05'46"W

APPENDIX 2

LIST OF EXCLUDED TAXA

The following have been reported from the study area, but neither herbarium specimens nor living plants were observed from the study area. We may have overlooked some of these taxa. Other excluded taxa are the result of misidentifications (probable misidentifications are marked by *).

Agoseris heterophylla (Nutt.) Greene*

Asclepias californica Greene

Calandrinia breweri S. Wats.

Castilleja applegatei Fern.*

Cephalanthus occidentalis L.

Cirsium brevistylum Cronq.

Clarkia purpurea (Curtis) A. Nelson & J. F. Macbr.
subsp. *viminea* (Douglas) H. Lewis & M. Lewis*

Delphinium hesperium A. Gray

Ericameria arborescens (A. Gray) Greene

Glyceria occidentalis (Piper) J. C. Nelson*

Hordeum brachyantherum Nevski subsp. *californicum*
(Covas & Stebbins) Bothmer, N. Jacobsen & Seberg
[H. c. Covas & Stebbins]*

Hordeum jubatum L. subsp. *jubatum*

Lepidium oxycarpum Torr. & A. Gray

Triglochin scilloides (Poir.) Mering & Kadereit (*Lilaea* s.
[Poir.] Hauman)

Microseris elegans A. Gray

Montia fontana L.

Navarretia viscidula Benth.

Nemophila pedunculata Benth.

Panicum capillare L.

Papaver californicum A. Gray

Perideridia oregana (S. Watson) Mathias

Polypodium scouleri Hook. & Grev.*

Ranunculus canus Benth.

Rosa spithamea S. Wats.*

Sagina decumbens (Elliott) Torr. & A. Gray subsp.
occidentalis (S. Watson) G. E. Crow

Solanum xanti A. Gray*

Turritis glabra L. (*Arabis* g. [L.] Benth.)